Chapter 1 Purpose and Need for Action

1.1 Introduction and Study Area

The proposed action is to treat approximately 359 acres of vegetation (336 acres contain merchantable timber) to restore/enhance forest health, vegetative diversity, and wildlife habitat using mechanical treatment methods. Public motorized access would be restricted yearlong on 3.86 miles of the Deadman Bench Road to enhance habitat effectiveness.

In order to avoid confusion with previous proposals, this proposal has been named Deadman Bench Vegetation Treatment Proposal. The project area for this proposal is within the larger area previously analyzed for the Ellsbury Timber Sale. A decision notice for the Ellsbury Timber Sale was issued on February 19, 1999, and subsequently appealed. The reviewing officer did not uphold the decision, and it was remanded back to the deciding officer on May 27, 1999 to correct deficiencies in the analysis and associated decision.

Following the remand, the line officer decided to take a fresh look at treatment options for the area. The primary purpose and management objectives have been redefined to provide management on an ecologically diverse area of land through manipulation of vegetative succession to assure long-term sustainability of the resource values and benefits of the area.

The intent of this proposal is to complement and reinforce natural processes (both structure and function) within the project area, based upon principles of restoration ecology. The proposed action is based upon an affirmative, conservation, land-based management approach.

This environmental assessment (EA) was prepared to disclose the potential environmental consequences of implementing vegetative treatment in the Deadman Bench area of the Clarks Fork Ranger District, as a means of moving toward the desired conditions for the area. This is a Shoshone National Forest proposal to manipulate conifer and aspen vegetation where necessary and appropriate to meet stated objectives on the reasonably accessible portions of the Deadman Bench area.

Analysis of the study area was completed considering both a coarse scale landscape view and a fine scale perspective. The focus was the 1,217-acre project area where treatments are proposed. A 15,767-acre diversity unit was used to analyze most resources, with the exception of the grizzly bear where a bear management unit greater than 200,000-acre was used (Crandall subunit).

1.2 Location of Proposed Action

The proposed action would occur within portions of Sections 7, 8, 9, 10 and 16 in Township 55N and Range 105W, 6th Principal Meridian. The area that was evaluated for treatment with this analysis (proposed project area) can be described, in general, as the area between the Deadman Bench Road (Forest Service Road [FSR] 144) on the north, Reef Creek Road (FSR 115) on the west, and the Camp Creek Road (FSR 114) on the south and east.

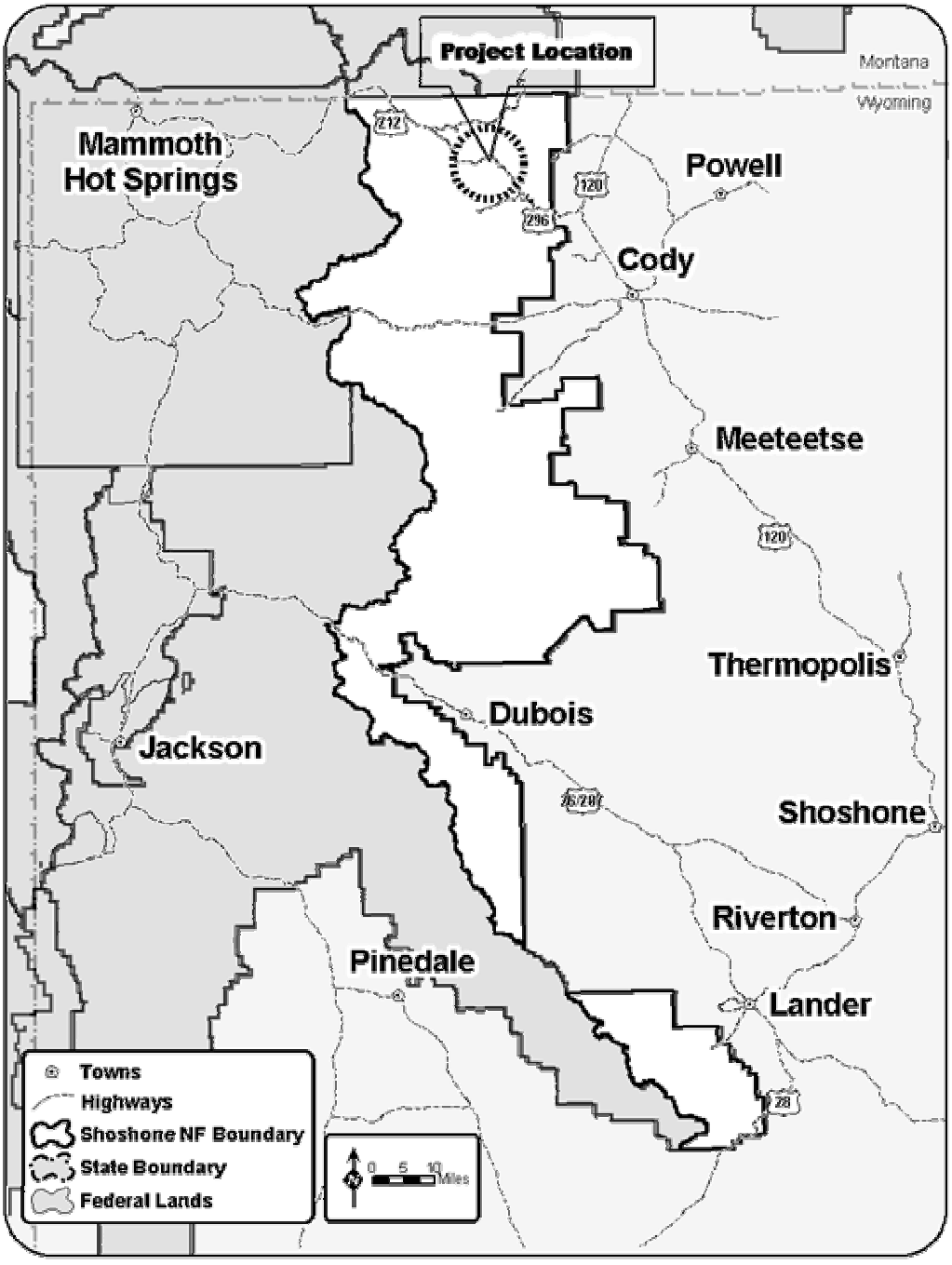


Figure 1. *The proposed vegetative treatment on the Deadman Bench is approximately 30 miles northwest of Cody, Wyoming.*

1.3 Summary of the Desired Condition for Vegetation in the Project Area

The interdisciplinary team (IDT), based upon Forest Plan direction, formulated the desired vegetative condition relative to this specific project area. *Achievement of desired forest conditions defined by Forest Plan goals is of higher priority than application of specific practices or achievement of objectives (Forest Plan III-6).* The desired condition is managed vegetation dominated by a healthy diverse coniferous forest, in a mosaic of patterns with a mixture of species, age classes, and patch sizes distributed throughout the area. Forested areas would be complemented by meadows in good condition, and minor vegetative types such as aspen, willow, alder, and other deciduous species would be at their natural potential levels with a variety of age classes. The understory vegetation would include a wide variety of vegetative species. Vegetative patches would be arranged such that interspersion and juxtaposition enhance habitat value.

Vegetation would be vigorous and healthy with insects and disease at endemic levels, and fuel loads and the risk of fire would be within manageable suppression limits. Riparian types would be well developed, highly functional, and dominated by mid-seral deciduous species in order to provide maximum beneficial functions. Wetlands would be mid-seral with a highly diverse mixture of deciduous and wetland related plant species. Soil would be stable and highly productive, and water would be of high quality.

Wildlife habitats would be diverse and of high value, and be effective in providing a wide variety of niches for all the dependent species. Corridor linkage would provide secure avenues for movement, and the distribution and positioning of patches over the landscape would be toward the most desirable for species of concern.

1.4 Project Design

This project was designed from the start using design criteria that avoid, eliminate, or reduce adverse effects of an action, or conservation measures that improve or enhance beneficial effects of the opportunities associated with an action. Many of these conditions and preventive practices are called for as directed by standards and guidelines from the Shoshone Land and Resource Management Plan (Forest Plan) as amended, the Grizzly Bear Recovery Plan and Grizzly Bear Guidelines, and other management direction.

Many, such as diversity requirements, security area requirements, and linkage corridors are design criteria that have to be incorporated and analyzed over landscape areas such as diversity units. Other design criteria, such as old growth stand retention size requirements, or scheduling requirements in grizzly habitat are project and operations specific design criteria that must be integrated into conditions and provisions of permits, contracts, operating plans, and project preparation or administration procedures.

Still other design criteria are not directly included in the Forest Plan, such as BMPs (best management practices), but are clarification of or specific technical guidance on how to comply with Forest Plan and other required standards and guidelines. These conditions are required by statutes and regulations such as the Clean Water Act (particularly Section 404 and its associated regulations for implementation, which include mandatory BMPs), State of Wyoming Water Quality Rules and Regulations, and Executive Orders. Again, these must be incorporated into the project design and integrated into permits, contracts, and operating plans if compliance with their intent is to be assured.

Identification and integration of design criteria were an essential part of the formulation of this proposed action, at both the landscape area level and project level from the initiation of the

proposed action. Such up-front design allows implementation of and compliance with these design criteria such that the proposal would likely benefit and contribute to the conservation of proposed and listed species in the long-term, and adverse effects are minimized to the degree that the project would not likely adversely affect any proposed or listed species in the short-term.

Standards from the Forest Plan, Grizzly Guidelines, recovery plans, and other sources that were used as design criteria in the formulation and design of this proposal, and for analysis, are shown throughout this document where applicable and appropriate. Forest Plan standards relative to diversity, wildlife habitat, and activities affecting either, were based upon requirements of the indicator species of wildlife selected for forest planning. Design criteria relative to the listed grizzly bear were incorporated as an integral part of this particular project. In addition, because the Canada lynx was listed as an endangered species in April of 2000, design criteria from the Canada Lynx Conservation Agreement and the Canada Lynx Conservation Assessment and Strategy provided the basis for this analysis.

1.5 Purpose and Objectives of This Action

The overall intent of this proposal is to manage vegetative succession by direct manipulation in order to attain the long-term desired conditions. This is being done to help ensure long-term sustainability of the project area, which is the basis for goals in the Forest Plan. The primary purpose of this action is to maintain, restore, and/or enhance all processes, functions, and conditions that are substandard or below the desired condition relative to diversity, forest health, wildlife habitat, and roads. The intent is to move toward desired vegetative conditions that are sustainable while capitalizing on the outputs or products that contribute to the social and economic well being of dependent communities. *This is in compliance with the Forest Plan direction that emphasizes high quality non-commodity goods and services by using commodity production to enhance non-commodities whenever possible (Forest Plan III-11).*

The specific objectives for the Deadman Bench proposal were formulated by the interdisciplinary team based upon direction contained in the Forest Planning Regulations (CFR 219), Forest Plan direction, and the Forest Plan goals as stated in Forest Plan pages III-6-10, as follows:

- Enhance vegetative diversity by enhancing the abundance and seral stages of minor vegetative types (aspen, deciduous, riparian, wetland, lodgepole pine, and interior meadows)
- Contribute to forest health relative to insect infestation by removal of highly vulnerable brood trees having characteristics that make them highly susceptible to attack, as well as by reducing basal area

Minimize the risk of wildfire by reducing natural accumulation of fuels and breaking up the continuity of ladder fuels and canopy closure to enhance fire suppression capability

- Enhance habitat value of selected Management Indicator Species (MIS) of wildlife where vegetative conditions are well below biological potential, while maintaining habitat value for other MIS above minimal acceptable conditions
- Enhance habitat effectiveness for grizzly bear and big game by implementing *road closures and restrictions* where road densities are excessive
- Capitalize upon commercial forest product output opportunities associated with vegetative treatment
- Restore proper soil/water functioning on substandard roads within the project area by *restoration to standard, relocation, closure, or decommissioning as appropriate*

The agency initiated this action because the existing conditions on the land are below the desired conditions, thus putting the area at risk for catastrophic disturbance.

The environmental analysis documented in this EA is tiered to the Final Environmental Impact Statement for the Shoshone National Forest Land and Resource Management Plan (Forest Plan) approved in 1986, as amended.

This environmental assessment is not a decision document. It is a document disclosing the environmental consequences of implementing the proposed action and alternatives to that action. A decision relative to this proposal will be documented in a decision notice signed by the District Ranger, who is the responsible official. A decision will be prepared and distributed, along with publication of a legal notice in the *Cody Enterprise*, after 30 days of public review and comment on the predecisional EA

1.6 The Need For This Action

The 1988 Clover Mist Fire resulted in stand replacement burns in many of the forested stands in the immediate vicinity of the project area, setting the burned stands' succession state back to early seral grass/forb stage. This has changed the overall condition of structural diversity in the Reef Creek area toward a mix of early seral and late seral stages. It also has had an effect on characteristics of patch or stand size, and more importantly the interspersion of both vegetation type and structure. As mature conifer stands are now fewer and very concentrated, their value for wildlife has been elevated, and they are most likely being used disproportionately by many species of wildlife, especially those requiring characteristics associated with mature forest.

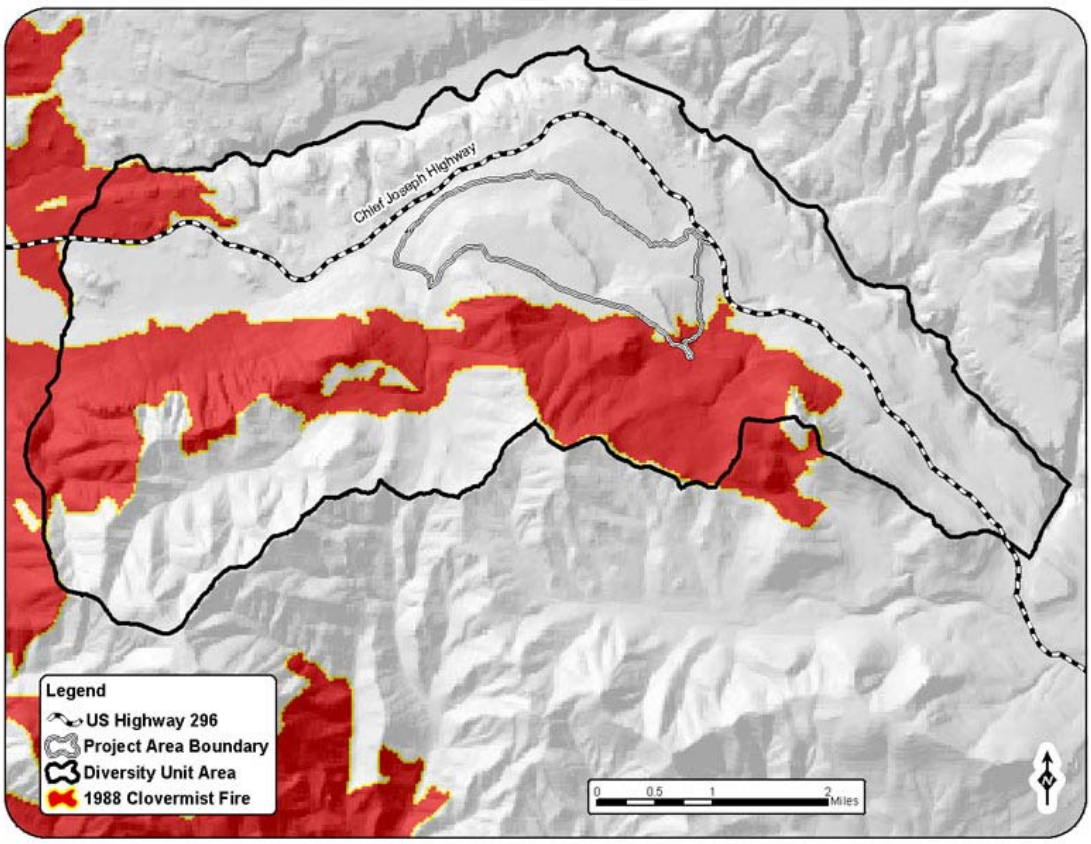


Figure 2. *In 1988 the Clover Mist Fire burned approximately 4,434 acres (28%) of the 15,767-acre diversity unit.*

The older succession forested areas of vegetation within the Reef Creek area are now of higher value ecologically for forest dependent species, and are at substantially higher risk of loss from natural disturbance factors than they were prior to the 1988 fires due to epidemic levels of insect infestation. The specific area in which this proposal (and previous proposals) is planned is within the Forest Plan, Crandall 1 Analysis Area, which was also identified in the Forest Plan Allowable Sale Quantity (ASQ) Environmental Impact Statement (August 1994) as an area of natural resource concerns (Chapter III, page 56).

The ASQ Record of Decision (August 1994) stated that timber harvest in areas of natural resource concerns and areas with other management concerns is delayed for up to 30 years as a result of the 1988 fires burning much of the suited timber base. The rationale for this delay is contained in the EIS (III-47), and was because the extensive size of the burned area has complicated providing a mix of habitat situations in some areas, and has elevated the value of remaining forest cover for wildlife.

In those areas of delayed harvest, of which this proposal is one, the ROD further states that some harvest could be possible if further analysis indicates that Forest Plan standards and guidelines can be met (page 2). Although the ASQ ROD delayed harvest in this area, there is a need to consider this action at this time because of the area's high vulnerability to insects and wildfire. There is a very real potential for loss of the same habitat values related to mature timber that the delayed harvest decision was trying to protect, such as old growth, heavy canopy cover, and hiding cover.

Forest health within the project area is well below the desired condition. Epidemic levels of insect infestation have already killed much of the large conifer trees, and more mortality is imminent because of the large amount of older and bigger trees that are vulnerable to attack within the project area. In addition, the abundance and distribution of some deciduous species of vegetation such as aspen, willow, birch, and alder are decreasing at an accelerated rate due to advancing succession.

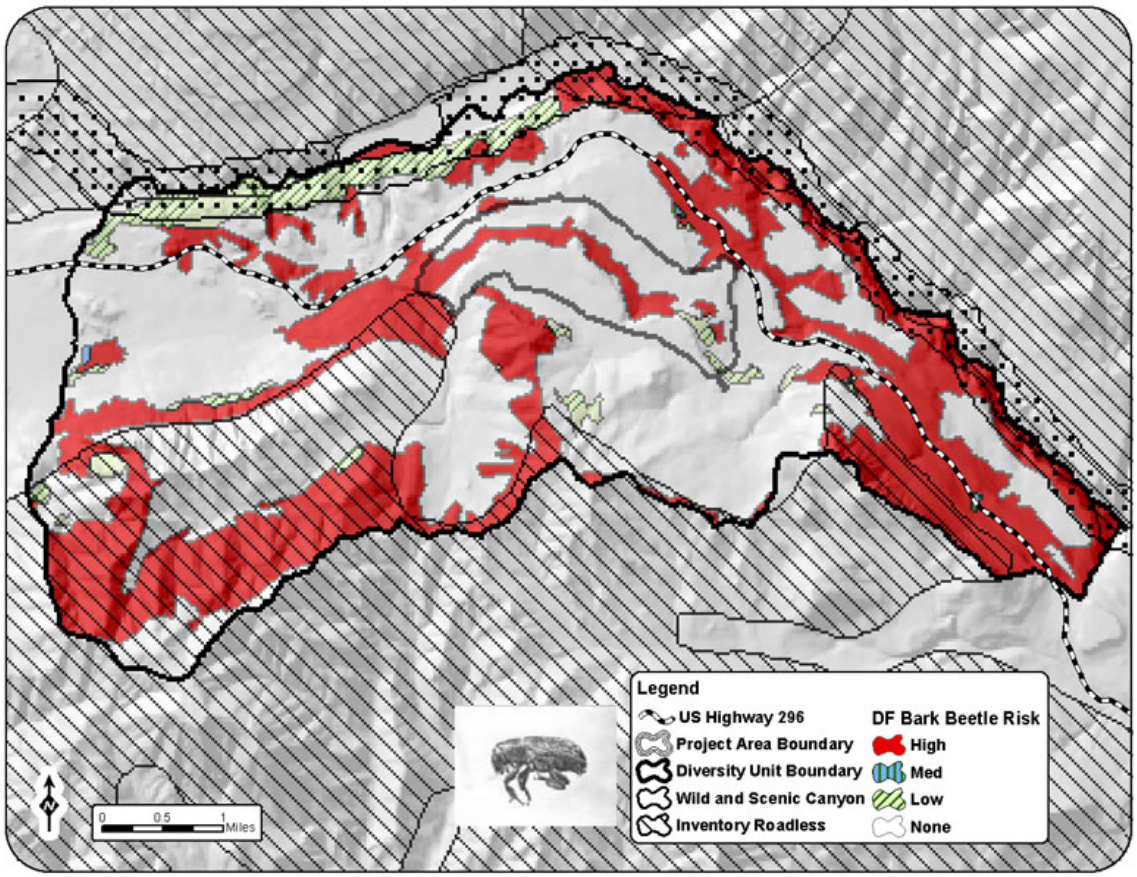


Figure 3. *The Douglas-fir beetle presents the most serious pest hazard within the project area, and has been at epidemic population levels since 1989.*

The project area also possesses fuel characteristics that make it highly susceptible to a stand-replacing wildfire due to the mature/over mature status of the majority of forested vegetation. These conditions include late successional understory tree species that produce ladder fuels from the ground to the dominant overstory tree species; epidemic levels of Douglas-fir beetle that are causing high mortality in large diameter Douglas-fir, producing current and future additional down fuels; continuity of tree crowns; and current high fuel loading levels. The 1988 Clover Mist Fire currently provides an excellent break in fuel loading and continuity within the southern portion of the diversity unit. Within this area, the fire burned so intensely due to extreme fuel and weather conditions that over 80% of the forested area experienced a stand-replacement fire. This area will continue to provide this break for a number of years until the regeneration matures enough to provide a continuous fuel bed of fine fuels to sustain a flaming front, and the standing dead fall and rot, providing spot receptors that contribute to fire spread. The remaining forested portion of the diversity unit (60%) has not had fire for 100+ years. These forested areas contain fuel characteristics comparable to the areas that burned in 1988 but due to topography and wind direction were spared. With time and continued lack of wildfire, fuel loading will continue to increase from current standing dead trees from beetle mortality, and late succession tree species will continue to grow and regenerate providing continued ladder fuels and tighter canopy closure until a natural or human caused fire occurs and weather conditions are extreme and the remaining portion of the diversity area will burn.

Four natural-caused fire starts have occurred and were suppressed within the project area within the last two years. Three of the four fires had a high potential of burning the remaining area; due to the availability of suppression resources and a quick response, these fires were suppressed.

Within the diversity area, over 200 acres of private property occur in three different parcels that contain buildings and other improvements that require protection from wildfire.

In addition to the needs identified above relating to concerns about the potential for loss of important habitat conditions, there is also a need for management based upon enhancement opportunities. Many opportunities exist for enhancement of diversity, habitat value, and habitat effectiveness. The forested vegetation in the project area is considerably different from the desired condition relative to vegetative diversity and overall wildlife habitat value and effectiveness. The condition of many of the accessible timbered stands within the project area can be enhanced relative to vegetative diversity and wildlife habitat. There are enhancement opportunities available relative to habitat of several Management Indicator Species of wildlife, and minor vegetation species that contribute to diversity. This is because vegetative conditions are well below potential relative to these factors.

There is also a need to consider commercial forest product opportunities because of the condition of potential forest products. As a significant portion of the potential salvage component of dead trees has been dead between five and ten years, their commercial value has already decreased, and will decrease more dramatically in the near future due to accelerated deterioration. The green tree component that could be harvested using sanitation harvest (insect infested and high-risk decadent trees expected to die in the near future) will also lose merchantable value over time due to deterioration.

If treatment of vegetation in the Deadman Bench area is be accomplished using commercial timber harvest as a tool, then it is necessary to implement treatment in the near future, or there will likely be insufficient merchantable value of commercial products such as sawtimber and house logs to attract any purchasers. It does not appear that there is any cost effective tool other than commercial timber harvest for dealing with the high volumes of large trees necessary for attainment of the multiple objectives.

Because of these factors, Forest Plan direction compels us to initiate management actions that reduce susceptibility to hazards and capitalize upon enhancement opportunities while helping to assure long-term sustainability of vegetative diversity and the related resources in these areas. The susceptibility to risk factors of wildfire, insect infestation, and loss of biodiversity can be reduced, and enhancement opportunities can be capitalized upon by proper silvicultural treatment specifically designed to be responsive to these factors. Such vegetative manipulation would contribute to long-term ecosystem sustainability, as well as contributing to the social and economic well being of the adjacent communities.

1.7 Description of the Proposed Action (Alternative II)

The following is a summary of the actions being proposed, and the reasons for the actions, relative to this project. An in-depth description of the included work activities, timing, methods, and discussion of other aspects of the proposal can be found in the description of Alternative II, in the Alternatives Analyzed In Detail portion of Chapter 2.

Within the 1,217-acre potential project area:

- Harvest merchantable coniferous sawtimber using conventional tractor logging and a sanitation/salvage silvicultural harvest system on 336 acres of beetle infested, decadent, and dead timber to restore forest health while capitalizing upon commercial product opportunities.

- Using mechanical treatment, fell and remove the majority of non-merchantable conifers, and regenerate aspen as appropriate on 28 acres, to maintain/enhance the aspen type and to enhance diversity and to restore habitat for aspen related wildlife species.
- Using mechanical treatment, fell and remove the majority of conifers on 30 acres of riparian and wetland to set back succession. This action would increase deciduous vegetative species, enhance wildlife habitat for wetland and riparian associated species, increase diversity of type, and enhance the buffering function.
- Using mechanical treatment, fell and remove the majority of conifers from two small interior meadows within timbered areas to enhance interspersion and restore the integrity of the interior meadow type.
- Using mechanical treatment, fell and remove trees within the power line corridor that have the potential to take down the line in order to reduce the fire hazard associated with a down line.

To reduce the risk of wildfire, remove and dispose of excessive amounts of natural fuels within treated stands by piling and burning or removal.

Using mechanical treatment, break up continuous dense, late successional tree species contributing to ladder fuels and break the continuity of tree crown density that contributes to crown fire.

Treat all activity fuels resulting from treatment through yarding unmerchantable material (YUM), whole tree skidding and piling/burning as appropriate to limit fire intensity and spread for enhanced suppression capability and reduced tree mortality.

- Decommission an additional 0.32 miles of existing non-classified (non-system) road.
- Decommission all temporary roads used in conjunction with this project.
- Decommission 0.78 miles of the existing Deadman Bench Road (FSR 144) that is steep, substandard, or eroding at unacceptable levels in conformance with soil and water minimum standards in the Forest Plan.
- To provide access to Deadman Bench following the decommissioning of FSR 144, 0.49 miles of old timber access road coming off the Camp Creek Road would be reconstructed, and an additional 0.69 miles would be constructed to link this road to the existing Deadman Bench Road. This would provide motorized access to Deadman Bench for treatments and for future administrative use (i.e., access for power line maintenance and access for vehicular fire suppression capability).
- Upon initiation of the project, a permanent yearlong restriction would close 3.86 miles of road on the Deadman Bench to public motorized access. This is to enhance habitat effectiveness for wildlife, to enhance non-motorized recreation opportunities, and to protect other resource values.

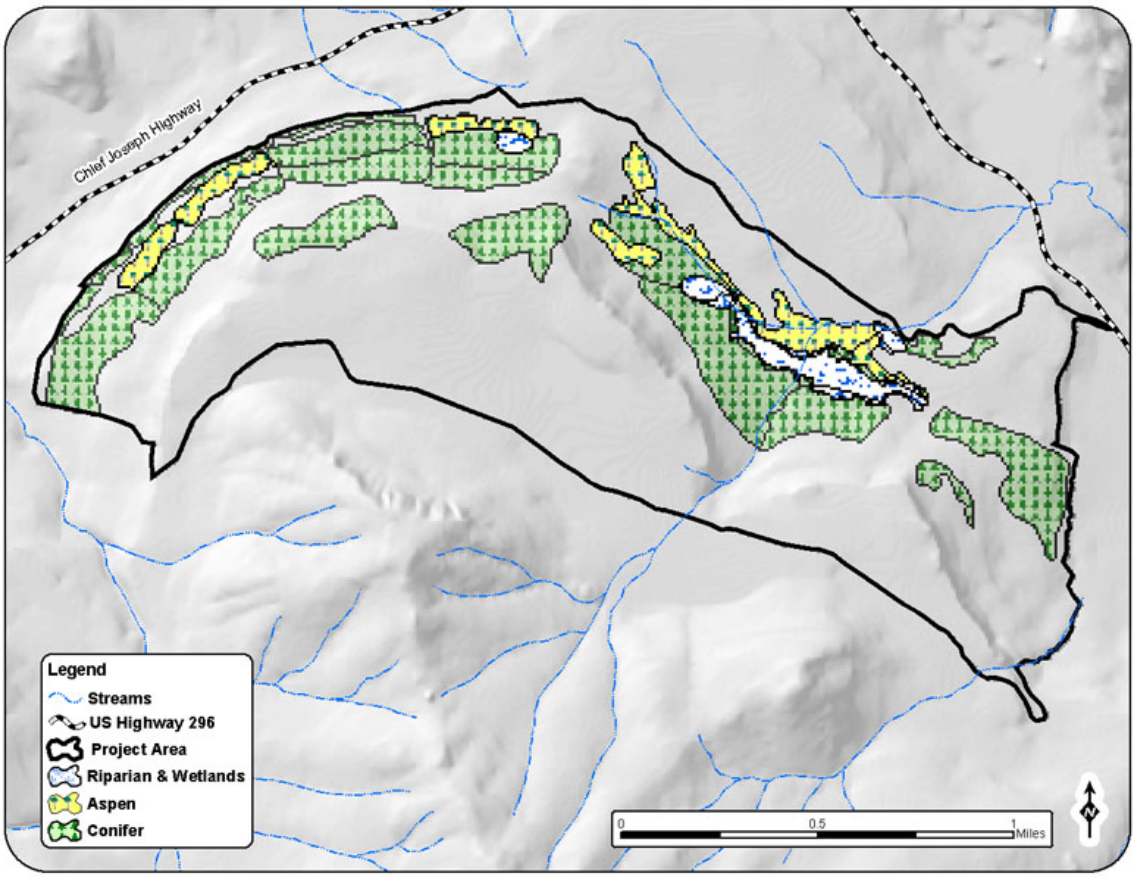


Figure 4. *Treatment units within the 1,217-acre project area with desired conditions for a diverse landscape of timberlands, aspen, riparian and wetlands.*

1.8 The Scope of This Analysis

The scope of this analysis will be limited to analyzing a series of alternatives relating specifically to vegetative manipulation and silvicultural practices being considered to meet Forest Plan direction, to minimize the risk of catastrophic natural disturbance factors, and to capitalize upon restoration and enhancement opportunities available relative to wildlife habitat, vegetative diversity, forest health, and fire suppression in the Deadman Bench project area only.

This document will not address visual management immediately adjacent to the Chief Joseph Highway corridor, as the proposed activities are not within the seen area of the highway. Neither will vegetative treatment, forest health, hazards from pest organisms, or opportunities in adjacent or additional areas of the Forest be addressed, as this analysis is limited to this project area.

Inventoried roadless areas are not present within the project area. Inventoried roadless areas do occur within the diversity unit; through project design, no timber harvest or road construction or reconstruction would occur within an inventoried roadless area.

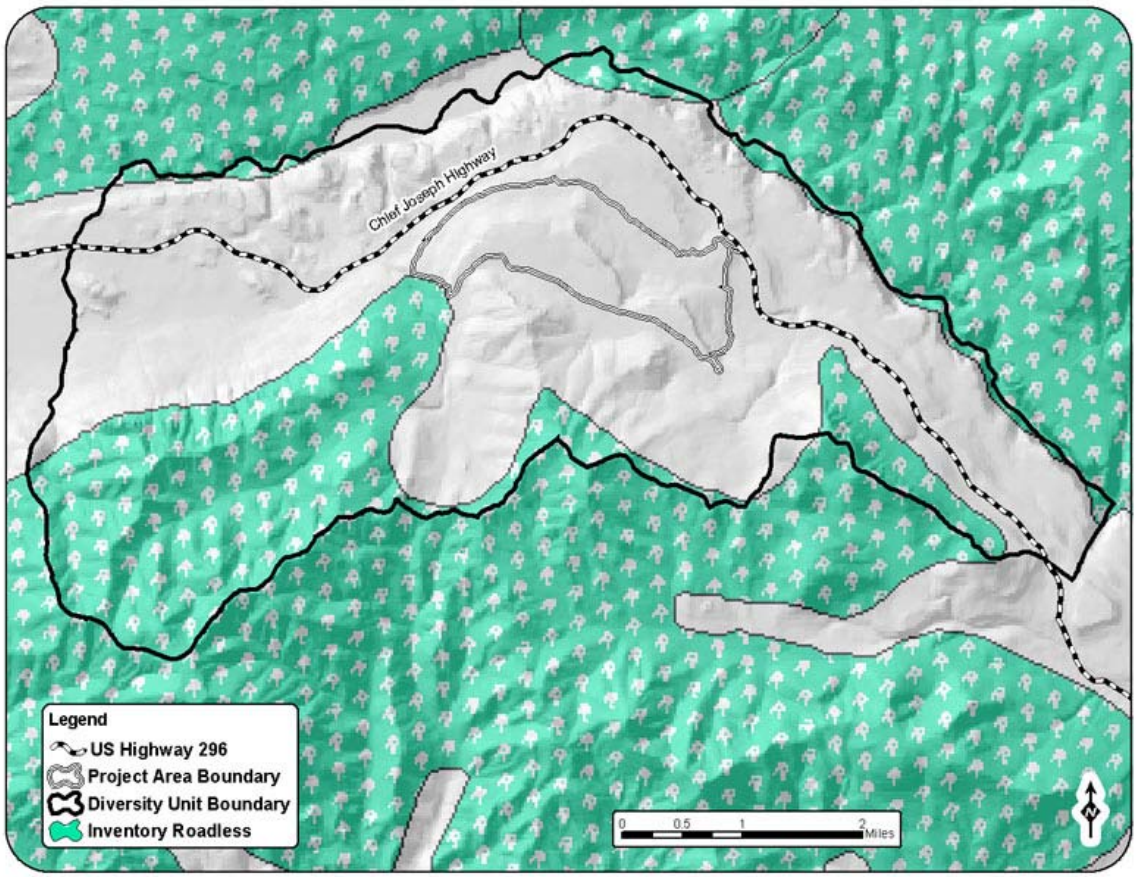


Figure 5. *The diversity unit encompasses 15,767 acres. Inventoried roadless areas do occur within the diversity unit. Through project design, no timber harvest or road construction or reconstruction would occur within an inventoried roadless area.*

1.9 Background

A portion of this project area has had timber harvested several times previously, the most recent in the 1960s, and the oldest appearing to be during the 1930s. In 1986, this area was scheduled for silvicultural treatment using timber harvest in the Ten Year Timber Sale Action Plan formulated as a part of the Forest Plan (page A-10). An EA was completed in 1991. Because of the litigation involving the Cathedral Cliffs Timber Sale (1992), the Forest Service agreed not to offer any additional green timber sales on the Clarks Fork Ranger District until a reanalysis of the allowable sale quantity (ASQ) and the associated Forest Plan Amendment was completed. As a result of this agreement, and the associated reevaluation of the Forest ASQ, no decision was made relative to this (1991) environmental analysis and the proposal was withdrawn.

A new EA relating to this proposal was distributed for public comment on June 26, 1996, which proposed both this area (called Ellsbury) and the Sugarloaf areas as a salvage sale under P.L. 104-19 (Salvage Sale Rider), whereby sales implemented under this law were not appealable. A decision was made based upon that EA, and then withdrawn as a result of the Secretary of Agriculture's July 1996 memorandum which stated that any sale or part thereof which has been identified to the public and then withdrawn for any reason could not go forward as a salvage sale under P.L. 104-19.

Upon receipt of the Secretary's Memorandum, the Forest determined it was necessary to redraft the 1996 EA, which was released in 1998. It was essentially the same proposal proposing silvicultural treatment in the same areas. Both a green timber component and a salvage component were included in this analysis. On February 22, 1999, a Decision Notice was signed allowing vegetative treatment on the four units located on the Deadman Bench, which were included as a part of the original 1991 Ellsbury Sale. Two of the units were in lower mixed species stands that had been treated previously, and two of the units were pure Douglas-fir stands on the upper bench which contained high levels of insect infestation and recently dead trees.

That decision was appealed based on inadequacies of the analysis relative to the biological evaluation, watershed effects, wetlands, and the lack of comparative information provided by a no action alternative. On May 27, 1999, the Regional Forester remanded the decision such that no action to implement that decision could occur "pending issuance of a new analysis and new decision document."

The Forest completed a Roads Analysis (RAP) for this project; the RAP is in the project file, and was based on the process outlined in Miscellaneous Report FS-643, Roads Analysis: Informing Decisions about Managing the National Forest Transportation System.

As the Forest has identified a need to manipulate vegetation to minimize the susceptibility to hazards, and to move toward desired vegetative conditions in this area, this new analysis was undertaken. This EA documents the new analysis of the environmental effects of vegetative manipulation specific to the Deadman Bench area, and alternatives to it.

The proposal was changed because of a reevaluation of the previous proposals and inadequacies of the original array of alternatives and projected effects. This proposal was designed to achieve the desired condition on a landscape and to capitalize upon enhancement opportunities as described in section 1.4, Project Design.

1.10 Public Involvement

Scoping is a process that involves anyone with an interest in voicing their thoughts and concerns to help identify the significant or relevant issues relating to a proposed action.

This proposal was originally scoped in 1990 during the original NEPA process. In January 1996, scoping was reinitiated in a letter that was sent to interested and potentially affected members of the public. This 1996 scoping letter indicated that a timber sale was again proposed for the Ellsbury/Sugarloaf area of the Clarks Fork Ranger District. Letter recipients were asked to provide comments on the proposal. Other federal, state, and local agencies were also consulted during this process.

In the 1996 scoping correspondence, the project was described as being a timber sale proposed for the Ellsbury area and tentatively scheduled for FY 1997. The people contacted were informed that the project would involve harvest of timber, road construction, road reconstruction, and construction of temporary roads.

The Forest IDT reviewed forest planning documents and other available literature on similar projects. Based on this information and on public comments, a list of preliminary issues was developed. Through analysis of these preliminary issues, the significant issues associated with the proposed action were determined (40 CFR 1501.7(a)(3)).

As an integral part of this new analysis, all preliminary scoping including that associated with the 1991 and the 1996 proposals was thoroughly reviewed, in addition to all responses relating to the release of the 1998 EA. All issues, concerns, and responses contained in the appeal record, as well

as the issues and concerns identified in the 1994 ASQ EIS relative to this area were also thoroughly reviewed.

It was determined additional scoping was not necessary following this in-depth review. This was because the previous list of issues and concerns covered all pertinent aspects relative to the proposal. It was also felt that the comments received on the predecisional EA would provide a final verification of the issues.

On June 5, 2002, a letter was sent to the American Indian tribes to notify them that a new EA with additional analysis was near completion. The letter explained that this project was the former Ellsbury timber sale, but had been renamed the Deadman Bench Vegetation Treatment Proposal to avoid confusion with previous proposals. The letter pointed out that the primary purpose and management objectives were to provide management through conifer manipulation and aspen regeneration to assure long-term sustainability of the resource values and benefits of the areas. It alerted them to the fact that a 30-day public comment period would be conducted once the predecisional EA was released.

1.11 Issues

Issues are points of dispute or contention, or areas or points of uncertainty relative to a proposal. Issues define perceived or real potential problems to be resolved by the analysis. Significant issues are those issues that drive formulation of alternatives and are analyzed in depth. Those points where the answer was not known, or when there was a major point of contention for which there was no firm consensus were considered to be significant issues. Significant issues were analyzed in depth in order to clarify the areas of concern or uncertainty, and to address the points of contention to the best of our ability based upon the best science and knowledge available.

Significant issues and concerns relative to this project were put in the form of analysis questions or problem statements. Each is an objective question that defines the problem(s) that are to be analyzed, evaluated, and answered. They define the specific facets of issues in terms such that they can be analyzed. Some issues have indicators for display of effects. Indicators are measures and standards by which effects are quantified, compared, and displayed.

A number of other issues were voiced in relation to the proposed action. Some issues, while valid and important, have been determined to be not significant within the context of the National Environmental Policy Act process. That is, they will not specifically drive the formulation of an alternative or be analyzed in depth. Among the reasons for this are that the issue exists whether or not the proposed action is implemented, or the issue relates to non-discretionary standards or measures that the Forest must apply regardless of the alternative to be implemented.

Biological diversity in general, habitat fragmentation at the landscape scale, neotropical birds, interior forests, major corridor/linkages, goshawk guidelines for the southwest US, and sink and source habitat will not be addressed as they are beyond the scope of a single project analysis.

Maintaining an adequate and continuing supply of timber products to the local timber industry in support of locally dependent communities, the below cost timber sale issue, cost-benefit ratios of vegetative manipulation for multiple use objectives, the validity of Forest Plan standards/guidelines and Forest Plan revision needs, and big game management strategies will not be discussed as they are also outside the scope of a single project.

This analysis will not consider long-term preservation as a management strategy for this area, as Forest Plan direction calls for vegetation in this area to be managed for many varied resource and human benefits. Neither will this analysis discuss herbicides nor prescribed fire as a means of vegetative manipulation in this specific area as they do not meet the intent of this proposal or of the Forest Plan for management of this area.

All of the aforementioned topics are either beyond the scope of this proposal or else they cannot be adequately addressed at the project level, and therefore are not relevant to reasonably foreseeable significant adverse impacts in this project area, nor are they essential to a reasoned choice among alternatives for this project.

Some issues were already addressed in that they were a part of the purpose and need for action and the reason for which the proposal is being made, or they were determined to be outside the scope of this analysis. Others issues will be addressed by required disclosure of effects. All comments, issues, and concerns were given in-depth review and consideration, however only significant issues are addressed in detail. Other questions and concerns relative to the proposal are clarified or addressed as appropriate in the EA.

There were several issues relevant to this proposal. These significant issues and the associated analysis questions that served as the basis for alternative formulation, and which were analyzed in depth, are described below.

1.11.1 Issue 1 Vegetative Diversity

What is the existing vegetative diversity relative to vegetation types, age classes, and distribution or differing patches in the area surrounding the proposed project area, and what is the desired condition relative to diversity of vegetation in the actual project area?

There is much concern that because of past timbering activities coupled with the fires of 1988, forest vegetation type and structure adjacent to the project area are not highly diverse. Diversity was a concern relative to live versus dead, patch size, edge, age class, interspersion, etc. Old growth especially, may be in limited supply. There is concern that any silvicultural treatment may further decrease vegetative diversity.

Most thought that if in fact mature stands of green timber are minimal in the area, or they are not well distributed, the existing stands are most likely being used disproportionately by wildlife at this time, and treatment to emphasize sawtimber outputs could result in loss of habitat quality and possibly population displacement for some wildlife species.

Some also thought that if this is the only island of green mature timber in a sea of early regeneration then possibly these stands should not be treated at this time. Others felt that even if the proposed area of treatment is a major center of wildlife use due to its green mature timber status, it is in a less than the desired state relative to providing diversity of composition (type), and being highly susceptible to natural disturbance factors such as insects, wildfire, etc. They felt that selective sanitation and salvage as well as other silvicultural treatment to enhance identified diversity factors, reduce the risk of catastrophic of natural disturbance factors, and to maintain and enhance specific wildlife habitat components would be beneficial to maintain long- term sustainability of desired vegetation conditions in the area.

Indicator(s): Potential effects of the different alternatives will be estimated based upon:

- Abundance (the amount by percentage) of each major vegetative type (which relates to horizontal diversity)
- Distribution of major vegetation types, as determined by the number of patches times the number of types
- Structural stage distribution as shown by the amount (percentage) of early succession versus late succession (including old growth) of coniferous forestland that relates to horizontal diversity. *Rather than address old growth as a whole throughout the document, components contributing to old growth character (age, canopy, dead and down, etc.) will be discussed separately when appropriate.*

- Amount of patches having complex vertical structure which correlates to vertical diversity

What is the existing condition of aspen within the project area, and if it is not in the desired condition, what potential exists for enhancement with this proposal? Also, should aspen be managed within the suited timber base?

There is some concern that some deciduous vegetation types, primarily aspen, may be in a declining mode in the project area because of advancing succession and conifer encroachment. If the aspen type is in fact declining, diversity and habitat quality could be enhanced using silvicultural treatment that takes out all sawtimber within aspen stands during the proposed action, and clone regeneration could be enhanced where necessary.

Aspen is an important component of diversity, an essential habitat for many wildlife species and visual component that adds differing form, color, and texture to the landscape. Because of these characteristics, some thought it should be maintained and enhanced whenever feasible, and others indicated that enhancement was directed in the Forest Plan. There was some concern relative to protecting regenerated aspen from overuse by livestock and wildlife.

Others thought that if this area is being managed to emphasize timber production, then these lands are to be managed for commercial coniferous species only, and aspen or other non-conifer and non-commercial species should not be a management concern.

Indicator(s): Potential effects of the different alternatives will be estimated based upon:

- Abundance (amount in acres) of aspen where it is an obvious component of a stand
- Age class distribution as shown by the amount (percentage) of early succession versus late succession aspen

1.11.2 Issue 2 Forest Health

What is the status of insect infestations in the proposed project area? What are the risks and projected short- and long-term effects of the Douglas-fir beetle as well as the associated fire hazard?

There was a lot of concern relative to forest health in this area, especially in regard to epidemic levels of Douglas-fir beetle, as this was the primary purpose for initiation of the proposal in 1996, as stated in the 1996 EA.

Some people believe that without reduction of high risk host trees adjacent to burned areas, the majority of mature Douglas-fir trees will become infested and die, losing any opportunities or values associated with these trees. Others felt that the risk factor was overstated, and that insects are a part of the natural system. They felt that control of Douglas-fir beetle was just another means of justifying the silvicultural action.

Still others are concerned that if the agency were truly concerned about such risks, the total Deadman Bench and adjacent areas within the suited timber base should be considered for treatment, not just a couple of small areas and a small percentage of the trees at risk. In addition, those thought that if insect prevention is of major concern, treatment should attempt to minimize the susceptibility by significantly reducing the basal area, which is a proven control method.

Many thought that a stand replacement fire such as occurred in areas adjacent to the project area is a real threat within the project area due to existing stand and fuel conditions. Most thought that reduction of the fire hazard was appropriate, and a few thought that the area should be fire proofed to the highest degree possible by major thinning of the stems and canopy and minimizing the amount of ground fuels. Others thought that fuels reduction and enhancing roaded access for

administrative purposes, in order to enhance suppression capability was called for, but fireproofing would result in significant negative effects to other values, especially wildlife cover.

Indicator(s): Potential effects of the different alternatives will be estimated based upon:

- Acreage treated for insects
- Probability of a stand replacement fire

1.11.3 Issue 3 Wildlife

What effect will this proposal have on moose habitat, specifically during the wintering period relative to the amount and structure of the subalpine fir type, which provides both food and cover primarily during the winter period? Will the regeneration maintain a sufficient amount of subalpine fir type to provide high quality moose wintering habitat in the future?

A portion of the project area is classified crucial winter range for moose. There is concern that the proposed action may decrease the amount of subalpine fir trees to a degree that insufficient amounts may be available for food and/or cover during the winter period. There was also concern that the treatment may overly favor regeneration of species other than subalpine fir.

Indicator(s): Potential effects of the different alternatives will be estimated based upon:

- Acreage and structural stage of Engelmann spruce/subalpine fir type

How will this proposal affect the composition and structure of vegetation relative to elk movement, specifically travel corridor linkages, and security cover, especially adjacent to the highway?

The Game and Fish Department is concerned that the proposed action may hinder movement of elk across the highway, especially if stands adjacent to the highway are thinned to the degree that they do not provide adequate security cover. Seasonal movements through this area are well established.

There is concern relative to having sufficient cover to hold elk in the general area during hunting seasons. There is also concern that a sufficient amount of high quality tree cover be maintained throughout the area in order to maintain the existing level of habitat effectiveness for all existing species.

Indicator(s): Potential effects of the different alternatives will be estimated based upon:

- Acreage and distribution of secure hiding cover available
- Connectivity of travelways

How will this proposal affect habitat value and habitat effectiveness for the grizzly bear?

Many people are concerned about this project's potential effects on grizzly bears. Specifically they want to know the existing habitat value and habitat effectiveness, and the comparative habitat values and habitat effectiveness resulting from implementation of the proposal.

Some felt that timber harvest would further decrease habitat diversity, which they think is already low. They thought that the capability of the habitat would be decreased relative to the bear and prey species such as elk. The overall result would be loss of habitat, displacement of several prey wildlife species, and negative long-term effects on the bear population.

Others felt that vegetative manipulation to enhance those vegetative types and components critical to the bear would be beneficial. They felt that several vegetative components, such as wetlands being encroached by conifers, berry producing shrubs decreasing due to shading, and deciduous species such as aspen, which is a major browse species for many prey species of the bear, were well below potential. They felt that these deciduous vegetative components and wetland types which

bears prefer during certain periods could be enhanced by this proposal, thus enhancing both vegetative diversity and quality of habitat for the grizzly in this specific area.

There are also concerns as to how this proposal would comply with the draft Grizzly Bear Conservation Strategy habitat management objectives relative to Open Motorized Access Route Density (OMARD), Total Motorized Access Route Density (TMARD), secure habitat, habitat effectiveness, and habitat value.

Indicator(s): Potential effects of the different alternatives will be estimated based upon:

- Habitat effectiveness coefficients (%) by season
- Percentage of subunit in secure habitat

How will this proposal affect wildlife habitat value generally, and habitat effectiveness relative to human disturbance and displacement in general?

Some wanted to know the existing habitat value in the project area, and the potential for habitat improvement. They were also interested in use of the area by wildlife relative to human disturbance factors that might cause displacement (timbering, roads, etc.), both presently and after treatment.

Indicator(s): Potential effects of the different alternatives will be estimated based upon:

Habitat value

- Riparian/wetland acres enhanced
- Aspen acres enhanced
- Road density

Many other habitat value factors are included in the diversity section of this document as those habitat factors are addressed under diversity in the Forest Plan. Habitat effectiveness is also addressed in those sections of this document that relate to elk and grizzly bear.

1.11.4 Issue 4 Soil and Water

How will this proposal affect soil and water, especially since the action will occur within an area identified as a watershed of concern?

Some are concerned about roads and possible impacts on soil, water, and aquatic resources in an area designated as a validated watershed of concern (ASQ EIS). There is concern relative to water quality, especially concerning the Clarks Fork River, which has status as both a Wyoming Class I water and a National Wild River. People are concerned about possible effects of this proposal on potential sedimentation and runoff, and felt that a description of where and when Best Management Practices that would be applied would be appropriate.

Others want to know the details relating to wetlands within the proposed treatment, specifically the amount, location, and condition of the wetland. They are concerned that this proposal would degrade the wetland by causing sedimentation and altering the hydrology.

1.11.5 Issue 5 Roads and Access

How will this proposal affect the amount and density of roads, and what effect will this proposal have on motorized access in this area during and after the propose action? How will roads be managed during and after implementation of this proposal? How will this proposal affect motorized access? Will additional roads be constructed? Will existing and/or new roads be gated, closed to public use, decommissioned, or left open? Will there be a net increase or decrease in open roads and road density?

Many people have concerns about the construction of new roads and the reconstruction of old roads. Most feel that we already have enough open roads. They are concerned about the effects that roading may have on soil and water resources. In addition, they have concerns about the density of roads as it relates to wildlife use and habitat effectiveness. They also have concerns about the cumulative effects on wildlife due to roads and greater human presence; resulting in bear/human conflict, bear mortality, and disruption of a number of wildlife species.

Others have concerns about the lack of motorized access in many areas and feel that additional roaded opportunities should be made available. They feel that all existing roads should be left open, that there should be fewer restrictions on motorized access, and that seasonal and permanent closures restrict motorized access to public lands.

Indicator(s): Potential effects of the different alternatives will be estimated based upon:

- Road density-increase or decrease in amount of roads open to public motorized use in the area
- Miles of system roads constructed or reconstructed
- Miles of roads decommissioned to comply with soil/ water standards, or to enhance wildlife habitat effectiveness

1.12 Decisions to be Made

The primary decision to be made is whether to manipulate vegetation by using timber harvest as a tool to set back vegetative succession to a more desired condition. If an action alternative were chosen, it must be decided which specific areas would be treated, and the type of treatment for each area in order to maintain and/or enhance each area's multiple resource values (i.e., watershed and wildlife habitat values). Whether to leave open or restrict public use either seasonally or yearlong on the Deadman Bench Road (FSR 144) and the Camp Creek Road (FSR 114) will also be part of the decision.

Chapter 2 Alternatives Including the Proposed Action

2.1 Introduction

This chapter describes the alternatives (potential actions). These alternatives represent a range of reasonable alternatives. A reasonable alternative is one that can be implemented and achieves the purpose and need while not violating any minimum environmental standards. Four alternatives were analyzed in detail, and six were considered but eliminated from detailed study. Also included in this section is a table that summarizes environmental effects in comparative form.

2.2 Alternative Formulation

Alternatives to the proposal must meet the underlying purpose(s) for which the proposal is being made, as well as being responsive to the differing significant issues.

Each alternative must be directed toward meeting the purpose as defined by the project objectives outlined in Chapter 1. Those objectives are:

- Restore/enhance forest health relative to insects and wildfire
- Restore/enhance vegetative diversity for multiple benefits
- Restore/enhance wildlife habitat value and habitat effectiveness
- Restore soil/water conditions resulting from substandard roads
- Capitalize on commercial forest product opportunities

Each alternative must also be responsive to significant issues by providing a clear basis of choice as a real alternative to the proposed action. Each alternative must in some manner be responsive to:

- Vegetative diversity including aspen retention and old growth forest
- Forest health relative to prevention/reduction of hazards (wildfire and insects)
- Wildlife habitat, specifically Grizzly bear habitat value and habitat effectiveness, elk cover and moose wintering habitat
- Soil and water protection
- Road construction and access management

2.3 Forest Plan Direction

The proposal and alternatives to it must tier to Forest Plan management direction for this area of the Forest, and all alternatives must comply with Forest Plan management direction. Forest Plan management direction comes from several different areas within the Forest Plan. Forest Plan goals are shown in Section III (6-10) and were the basis for initiating this proposal, and were the basis for identifying the purpose and need for this proposal as shown in Chapter 1.

Chapter III provides direction in the form of forest-wide direction, and standards and guidelines that are applicable to all management activities and all management goals throughout the Forest (III-19 to III-98). Minimum standards and guidelines for all resources expressed in the cited pages must be met in all alternatives. Other standards encourage capitalizing upon beneficial opportunities to achieve desired conditions. Chapter III also contains goals, direction, and standards and guidelines for site-specific areas (III-99 to III-250).

The Forest Plan map indicates the general emphasis for management areas. To emphasize means to provide for the management of, it does not mean to maximize a single product or resource at the exclusion of all other things. In other words, most general management areas include a great variety of vegetation including coniferous forest, deciduous forest, sagebrush-grasslands, meadows, and roads, campgrounds, administrative sites, etc.

As an example, a 7E management area (emphasis on wood fiber production) does not in any way indicate that the total area, or even all timber stands within the area are to be managed to maximize timber production, no more so than a 2B management area (emphasis on roaded recreation) is managed to maximize recreation at the exclusion of producing wood fiber for commercial use.

However, within each general management area, many other site-specific management goals may apply (i.e., developed sites, transmission corridors, riparian, aspen, etc.). The majority of these specific site goals are not shown on the Forest Plan Map. This is because these sites or areas were so small and scattered, and it was not possible to map resources and activities to such a small scale for display purposes during Plan formulation (*see* footnote 1 on Plan pages III-99 and III-103).

The following Forest Plan management area goals are relevant to this analysis:

- 1D, which provides for utility corridors (III-114-117). Note: Management Areas for 1D-Utility Corridors were too small and scattered to be mapped at the planning map scale and were therefore not specifically delineated on the Forest Plan maps contained in copies of the Forest Plan (Section III, pages 99 and 103, footnote 1/).
- 4D, which provides for maintaining/improving aspen sites (III-153-157). Note: Management Areas for 4D-Aspen were too small and scattered to be mapped at the planning map scale and were therefore not specifically delineated on the Forest Plan maps contained in copies of the Forest Plan (Section III, pages 99 and 103, footnote 1/).
- 7E, which provides for wood fiber production and utilization of large round wood of a size and quality suitable for sawtimber (III-173-180); recreation opportunities can be either motorized or non-motorized dependent on other resource considerations
- 9A, which provides for riparian area management (III-207 -222). Note: Management Areas for 9A-Riparian were too small and scattered to be mapped at the planning map scale and were therefore not specifically delineated on the Forest Plan maps contained in copies of the Forest Plan (Section III, pages 99 and 103, footnote 1/).

2.4 Monitoring Common to the Action Alternatives

If an action alternative were implemented, site specific monitoring would be as required in the Forest Plan as amended. Monitoring requirements of the Forest Plan can be found in Chapter IV (Monitoring and Evaluation), pages IV-1-10, and the Monitoring Amendment.

Units treated with a regeneration treatment would be monitored one, three, and five years after the harvest to ensure adequate regeneration (ASQ ROD Appendix A, page 5 and Forest Plan III-66-68, III-178-180).

Noxious weeds monitoring. Following treatments, areas would be monitored for the presence of exotic species and to evaluate the effectiveness of any treatments or protection measures.

Aspen monitoring. The project area would be monitored for compliance with the specified rest period, and appropriate measures, e.g., electric fences, implemented to keep livestock out of treatment areas. If it were determined, following monitoring, that cattle are damaging aspen regeneration, additional measures to meet aspen recovery would be implemented.

Soil monitoring. Effects on compaction, displacement, and organic matter would be monitored during project implementation.

2.5 Alternatives Considered and Dismissed from Detailed Analysis

Previously selected alternative. The alternative selected in the Ellsbury Timber Sale EA was dismissed from detailed analysis. This alternative was eliminated from analysis because it did not include multiple use opportunities for moving toward desired conditions.

Treatment using prescribed fire. As stated in the scope of this analysis section in Chapter 1, this alternative was not considered because the existing high risk of loss to fire was one of the primary reasons for initiating this proposal. In addition, it was eliminated because it does not meet the purpose/need of the proposal or contribute to the attainment of the objectives of the proposal.

Treatment of Douglas-fir beetle using insecticides, baiting, and trapping. This alternative was dismissed from detailed analysis, as it is not an effective means of control over large areas. Spraying of insecticides poses hazards to many beneficial species, and to human health. Baiting and trapping still require trees to be felled, and opportunities for use of felled trees would be lost.

Multiple entries. This alternative would allow for manipulation of vegetation on separate segments of the Deadman Bench with several entries to sanitize coniferous forest types for forest health purposes where appropriate, and to enhance minority vegetation type diversity. Each entry would cause major disturbance and be for a period of several months over several years. Although this alternative would address a variety of concerns, it prolongs the period of major disturbance to wildlife over an extended period, which is contrary to the proven concept of minimizing disturbance by limiting the number of treatments and the time for disturbance. It was therefore dismissed from consideration.

Treatment using helicopter or cable logging. This alternative was considered, however it does not appear to be economically viable at this time because of insufficient volumes. Therefore, an alternative requiring only helicopter or cable logging methods was not analyzed in detail.

Treatment that decommissions all roads within the project area. This alternative was initially considered as a means of emphasizing conservation of the grizzly bear by enhancing secure habitat. It is the same as the proposed action except that the road system within the project area would be decommissioned after treatment to provide secure habitat. There is little difference between the amount and quality of secure habitat related to restricted roads or decommissioned roads because of the influence zone from other open roads adjacent to the project area (Highway 296 and the Camp Creek Road). Because there is little additional secure habitat by decommissioning in lieu of road restrictions, and as this area is within the suited base and road decommissioning is inappropriate as long-term access is required, this alternative was eliminated from in-depth analysis.

2.6 Alternatives Analyzed in Detail

Based on the significant issues, the following alternatives were analyzed in detail. They are described below as to the major defining actions, the issues they respond to, and any specific design standards that are associated with them.

2.6.1 Alternative I

This is the no action alternative required by NEPA regulation (40 CFR 1502.14 (d)). It establishes the resource base line for analysis and for comparing alternatives. The intent of this alternative is to leave things as they are, and allow natural processes to control the progression of vegetative change.

The road system and road management would remain as it is. Figure 17 shows the existing transportation system in the project area.

Under this alternative, vegetative change and environmental consequences would still occur because the existing environment is not static.

Actions and Outputs

None of the proposed actions would occur, and there would be no additional outputs.

2.6.2 Alternative II

This is the proposed action. The intent of this alternative is to enhance forest health by decreasing fuel loading, enhancing fire suppression capability, and reducing the insect hazard while simultaneously enhancing vegetative type diversity and enhancing wildlife habitat value and effectiveness. It is intended to respond to multiple issues of forest health, vegetative diversity, and wildlife habitat.

Actions and outputs

Sanitation/salvage timber harvest. This alternative would harvest, using conventional tractor methods, 336 acres of dead and high-risk commercial coniferous sawtimber using a sanitation and salvage harvest system. Sanitation harvest includes removal of green trees that are damaged, diseased, decadent, or highly vulnerable to insect attack based on known characteristics. Salvage harvest removes dead trees. This is a means of reducing serious, long lasting hazards and risks from pest organisms and fire using both a prevention and treatment strategy. This action would result in an output of approximately 5.6 MMBF of commercial *sawtimber-sized products*.

Even though the vegetative stands on the upper portions of the bench under the reef have experienced extremely high levels of insect infestation and mortality, treatment of a portion of these stands would be deferred because they provide essential wildlife corridor linkage, special habitat such as old growth, or else they are not reasonably accessible using conventional tractor logging methods without major road construction.

Along a major portion of the forested edge adjacent to the large meadow on Deadman Bench with the exception of aspen clone areas, a portion of the wetland area, and a portion of the riparian area, harvest would be very selective, and limited to dead and over mature decadent trees having a high probability of dying within the next decade. This is to ensure adequate cover for wildlife travel corridor linkages adjacent to the grassland area until such time that harvested areas with inadequate cover presently are providing high quality cover.

In addition, mature trees within falling distance of the power line would be removed by implementation of this proposal, with the objective of reducing the potential for power outages in the Crandall area, and minimizing the fire hazard associated with lines being taken down by falling trees.

Aspen/deciduous species enhancement. In treatment areas containing aspen (28 acres) and other desired deciduous species (willow, alder, birch, dogwood, buffalo berry, etc.) where conifer trees are encroaching, conifers would be removed to the degree appropriate to favor enhancement of these deciduous species. This action would occur as a means of increasing deciduous species to improve diversity of vegetative types (as they are declining types due to advancing succession), to enhance wildlife habitat, and to provide natural fuel breaks to enhance fire suppression capability.

Conifer removal would occur using both commercial and noncommercial methods as appropriate. Merchantable conifer saw logs within aspen clones or other specified areas containing deciduous species would be removed using commercial timber harvest.

Removal of non-merchantable conifers within aspen clones and other specified areas, and regeneration of aspen clones within the next several years by cutting of mature stems, are connected actions to this proposed action. These connected actions are essential to meet objectives, and would be allowed over a several year period. Aspen regeneration would be allowed over an extended period because such actions would be a minor disturbance, occur over a very limited time (several days), and would be scheduled in a period that would minimize conflicts with other resources. Selection of aspen clones for regeneration in the near future would be based on evaluation of their response to elimination of conifer competition, their overall condition, and their potential for successful regeneration.

Leaving or using cut stems as a deterrent to livestock use would provide some protection for aspen regeneration.

Aspen clones selected for regeneration would be clear-cut, with some larger stems girdled to provide snags for cavity nesting wildlife species. Regeneration of clones would be scheduled over a several year period in order to provide staggered age classes and associated structure for diversity and wildlife purposes. Several clones that are highly decadent with few large stems remaining would be regenerated in conjunction with the proposed silvicultural treatment of conifers.

Lodgepole pine enhancement. As the tree cover types in this project area are primarily spruce/fir and Douglas-fir, lodgepole pine has a very limited presence except on some meadow edges. Lodgepole pine would be enhanced in the few interior forest areas where it exists, and along a portion of edges by leaving adequate seed producing trees as seed trees even though many may be mature and at high risk of mortality. This is being done because of lodgepole's importance to diversity, and because it is an important habitat component for wildlife species such as snowshoe hares (and dependent species such as lynx).

Wetland, riparian, and interior meadow enhancement. These areas comprise approximately 30 acres of the treatment area, including one large wetland of 21 acres and several small areas.

Willow/sedge wetland types are very limited on the Forest and within the project area because of natural succession and conversion to a drier coniferous wetland type. For enhancement purposes, the majority of coniferous trees in these wetland types would be removed in order to set succession back to an earlier seral wetland using group selection harvest methods. Treatment of wetlands would occur during the winter period when the area is frozen and snow covered.

Several small coniferous stands within the larger wetland area would be retained to provide cover for grizzly bear, moose, and other wildlife species. A sufficient amount of conifer tree cover would be left adjacent to the wetland and between the meadow and wetland to provide for the beneficial habitat functions of travelways and hiding cover.

The limited riparian area along portions of Deadman Creek would also be set back successionally to a mid-seral deciduous condition by removal of merchantable and unmerchantable conifer trees, using group selection harvest methods. Again, treatment of riparian would occur during the winter period when the area is frozen and snow covered. In those areas where there are only narrow stringers of coniferous forest on the slopes adjacent to the riparian (as well as those narrow timbered stringers dissecting the large meadow area), those stands would not be treated in order to maintain high quality travel linkage corridors for wildlife.

Several small meadows located within the timbered project area would have encroaching conifers removed in order to maintain existing natural grassland and shrubland openings. Merchantable trees would be cut and removed; non-merchantable trees would be cut and left on the site.

Fuels reduction. Both current natural and activity fuels would be treated to reduce fire intensity < 400 BTUs/sec/ft, or < four-foot flame length. By limiting fire intensity, tree mortality from a

surface fire and fuel induced probability of crown fire would be reduced on 90% of the days during the summer fire season.

Large fuels (> eight inches dbh), both natural and activity produced, would be removed through YUM and disposed of appropriately through firewood sales or piling and burning. Approximately 50 linear feet of dead logs would be left per acre to meet Forest Plan standards for nutrient cycling.

The smaller fuels (< three inches dbh) produced by the crowns and branches of the cut trees would be removed through whole tree skidding. Some branches and limbs would break off during felling and skidding operations but would become scattered and not continuous. The trees would be skidded to a landing before the limbs are removed, piled, and burned.

Post treatment fuel loading of all fuel size classes is estimated to be 15 to 20 tons/acre, with estimated fireline intensity meeting Forest Plan standard.

Road construction/reconstruction/relocation. Portions of FSRs 144 (Deadman Bench Road) and 114 (Camp Creek Road), along with Highway 296, would be used to access the project area. The first 0.42-mile segment of the existing Deadman Bench Road from the highway up the steep hill to the Deadman Bench that is substandard, and presently causing unacceptable erosion would be decommissioned. As this portion of road would be decommissioned and abandoned, access to the Deadman Bench would be provided with 1.18 miles of new road alignment connecting the Deadman Bench Road to the existing Camp Creek Road. The proposed new route for motorized access to the Deadman Bench would be provided by construction and reconstruction of 1.18 miles of new specified system road (0.49 miles reconstruction of existing road and 0.69 miles of new construction) connecting the Camp Creek Road to the existing power line road on Deadman Bench.

This relocation would begin at the old clear cut above the junction of the Chief Joseph Highway and the Camp Creek Road and follow the old timber access road across Deadman Creek. Upon reaching the flat adjacent to the wetland, 0.69 miles of new road would be constructed to avoid the wetland and connect with the existing power line road (FSR 144).

So that there would be no net increase in open roads in the area, the new alignment would be constructed and the existing alignment would be simultaneously decommissioned.

Use of temporary roads would be limited to the contractor and sale administrators only, and only during the period of operations. All temporary roads would be decommissioned immediately after having served their purpose for timber harvest. That portion of the Deadman Bench Road past the point where the road leaves the power line (0.36 miles) toward the west end of the project area would also be decommissioned upon completion of the treatment. *See* Figure 18 for a map showing the transportation system under Alternative II.

Access management during and after treatment. The Camp Creek Road would continue to be managed as it is by a seasonal restriction on motorized use from December 15 until July 15.

The new main access road on the Deadman Bench would be gated and closed to motorized access at its junction with the Camp Creek Road for public safety purposes upon initiation of treatment activities. Motorized use of the road would be permanently restricted by signing/gating upon completion of the vegetative treatment.

The only exceptions to this *closure* would be for the purpose of long-term administrative use (i.e., access for fire initial attack, follow-up KV treatments, and incidental access to the power line by the power company for maintenance). Total administrative use would generally be limited to 14 days between April 1 and November 15 when authorized by the line officer, and as necessary for emergency purposes.

The purpose of the permanent *closure* would be to decrease open road density in the area, eliminate ongoing resource damage caused by motorized vehicles, to enhance habitat effectiveness for

wildlife, to enhance non-motorized recreation opportunities, and to protect soil and water resources. The new road entrance to Deadman Bench would be designed for effective closure to all unauthorized motorized use. *The new closure structures would be located to preclude circumvention by vehicles.*

Other requirements. A ground based logging system (skidders, tracked vehicles, and other mechanical harvesting equipment) would be employed to accomplish the proposed action. Logs would be skidded or taken to a central collection point and removed by logging trucks to an off-Forest mill location.

Removal of logs from two upper bench areas would require a small cable/pulley system in order to gain access to the decking area for removal (less than 100 yards each).

Connected actions associated with this proposal include removal of non-merchantable conifers in areas that are being managed for deciduous species (e.g., aspen, riparian, wetlands) and regeneration treatments of aspen to maintain this vegetation type. The majority of these actions would occur following commercial harvest using the associated KV program or by force account.

Many stands within the project area are inaccessible and would continue to be managed by natural forces, with some possessing old growth characteristics (> 70% canopy, several canopy layers, large trees, snags, and downfall). Some accessible stands would be left untreated to meet diversity and wildlife standards and objectives. A sufficient amount of mature tree cover would be left in the area dominated by conifers (except in the aspen clone areas and a portion of the wetland area) to provide quality cover and secure travelways for wildlife, to provide for wintering moose, and to provide for other species dependent on mature forest vegetation.

Operational and Procedural Requirements

Contract period. Commercial timber products would be harvested under the terms and conditions of a three-year 2400-6 or 2400-6T Forest Service timber sale contract.

Operating season. The normal operating season would be a split season based on resource concerns. In specified areas, the operating season would be from July 15 to September 30, when soil moisture conditions allow, and December 15 through March 31 in specified winter logging areas (i.e., wetlands, riparian areas, and areas requiring snow roads).

Winter logging. Logging during the winter when the ground is frozen would be required in wetlands. In riparian areas and in upper benches where access is limited to a snow road, the ground must be frozen or covered with at least 12 inches of packed snow.

Cessation of activities. The timber sale contract would provide for cessation of activities, if needed, to resolve potential or existing grizzly/human conflicts.

Roads. Previously used skid trails and roads would be used where possible to minimize ground disturbance. All temporary roads would be decommissioned as appropriate and necessary after use. Gates *and other structures as needed to ensure effective closure* would be installed on the new *Deadman Bench Road (FSR 144)* to limit access during sale activities for safety. The existing gate on Camp Creek Road (FSR 114) would remain in place for continued seasonal closure.

Skidding. Skid distances would be increased to the degree reasonable to limit the need to construct new temporary roads or spurs.

Harvest scheduling. Harvesting of treatment units would be scheduled to concentrate use by time and space to prevent significant disruptions of normal or expected wildlife activity. There would be no reentry into this area for timber harvest purposes until at least 10 years from project initiation.

Logging camps. No logging camps for timber sale operations would be permitted in the project area.

Attractants. Storage orders for attractants would be adhered to. Crews would be required to have bear resistant containers available for storage of attractants such as lunches, garbage and beverages, and would be required to remove garbage and attractants from the work area each day.

Training. All crews would be trained in measures to minimize bear/human conflicts as well as proper attractant storage, bear behavior, recommended human behavior in conflict situations, and the use of bear repellant spray.

Snags. Within harvest units, retain at least six to 10 snags, twelve inches or more DBH (diameter at breast height), per 10 acres where biologically feasible. Retain in clumps if possible.

Dead and down. Retain a minimum of 50 linear feet of dead/down logs more than 10 inches DBH per acre where feasible.

Nest trees. From May 1 through July 31 protect nesting raptors by disallowing management activities within 300 feet of a nest tree.

Aspen. In aspen stands scheduled for treatment, even-age silviculture would be used. The appropriate regeneration treatment method is clear-cut for aspen. Fell and leave aspen stems in a jackstraw configuration to discourage livestock use. If overuse of regeneration areas by livestock becomes a problem, the area would be fenced during the grazing period.

K-V or Force Account Work. Cutting of noncommercial conifer trees in the aspen, wetland, and interior meadow types would be accomplished during the sale period or within two years after the sale. This would require approximately 10 days to accomplish. Aspen regeneration would occur over the next several decades to provide a diversity of age classes, and would require approximately 10 days total over the entire period. Aspen regeneration would occur over a very limited time (several days during any one year after the sale period), and would be scheduled during a period that would minimize conflicts with other resources such as grizzly or elk use. Selection of aspen clones for regeneration in the future would be based on evaluation of their response to elimination of conifer competition, their overall condition, and their potential for successful regeneration.

2.6.3 Alternative III

Under this alternative, a sanitation and salvage harvest would be implemented for forest health purposes. The intent of this alternative is to respond to the forest health issue (primarily wildfire and insects) while maintaining as much healthy forest cover in the short-term as possible, and maintaining some motorized access to the Deadman Bench.

Manipulation of vegetation would occur on the same areas of the Deadman Bench as the proposed action, to sanitize/salvage coniferous forest types for forest health purposes in order to reduce the hazard of insect infestation and wildfire.

Actions and Outputs

Public motorized access would be allowed on the new alignment of the Deadman Bench Road (FSR 144) during the summer and fall periods, but restricted during spring and winter to increase habitat effectiveness seasonally. Management of the Camp Creek Road (FSR 114) would remain as it is with a seasonal closure December 15 through July 15.

The primary differences between this alternative action and the proposed action are:

- There would be no purposeful actions to enhance vegetative diversity, wildlife habitat value, wetlands, riparian areas, or deciduous vegetative species.

- Public motorized use of the Deadman Bench Road would be restricted seasonally (December 15 to July 15) instead of yearlong for resource protection purposes (soil and water, wildlife birthing, and grizzly bear) to coincide with the seasonal closure on the Camp Creek Road. Public motorized access would be restricted during harvest operations for safety purposes. Figure 19 displays the roading that would result with implementation of Alternative III.

Ladder fuels and canopy continuity would be reduced over fewer acres. The acreage reduction impact on fuel characteristics of the diversity unit would be insignificant.

- Outputs of *sawtimber-sized products* would be approximately 5.1 MMBF.

2.6.4 Alternative IV

This alternative emphasizes enhancing productivity for sawtimber growth, as much of the project area is suited timber base lands. The intent of this alternative is to enhance forest health relative to wildfire and insects, and to enhance conditions that favor high-level growth of sawtimber by reduction of basal area (size and number of trees).

Due to minimal levels of hiding cover being maintained for several decades after treatment over much of the project area, public motorized use of all segments of road within the Camp Creek and Reef Creek road system (FSRs 114 and 115) would be restricted yearlong to maintain some meaningful level of habitat effectiveness, and provide a secure area that would allow the area to hold elk during the hunting season.

Actions and Outputs

Manipulation of vegetation would occur on the same areas of Deadman Bench as the proposed action.

The treatment would be a modified two-step shelterwood harvest in a majority of the treatment units. This would be done in order to enhance productivity of wood fiber over the long-term and to minimize the hazards of insect infestation and wildfire.

The basal area within treated stands would be reduced to a level that minimizes competition, enhances resistance to insect infestation, and maximizes growth of commercial sawtimber. This would be accomplished by removal (release/weeding) of additional merchantable sawtimber and undesirable trees. Also, some additional younger age-class stands not having a salvage component nor an over mature decadent overstory would be treated to assure proper spacing, to eliminate poor genetic growing stock, and to enhance individual tree vigor and resistance to pests.

The primary differences between this alternative action and the proposed action are:

- More basal area (more merchantable trees and smaller diameter trees) would be removed, canopy cover would be reduced to a much greater degree to allow more sunlight to enter the stand, and commercial timber outputs would be greater.
- There would be no purposeful action to enhance vegetative diversity, wildlife habitat value, wetlands, riparian areas, or aspen.
- There would be a yearlong restriction on public motorized use on both the Deadman Bench Road and the Camp Creek Road by yearlong closure of the existing Camp Creek Road gate starting with implementation of the project. This restriction is a result of the project area providing only minimal hiding cover and therefore not providing secure habitat for many wildlife species throughout the year, especially when the disturbance is at the top of the reef. Eliminating vehicular intrusions compensates for this loss of secure habitat by enhancing habitat effectiveness. *See* Figure 20 for Alternative IV's access management.

More trees would be removed, which would increase the break in continuity of ladder fuels and canopy closure. Again, the difference in reduction in wildfire risk is insignificant with this alternative but is better than Alternative III by a small margin.

- Outputs of *sawtimber-sized products* would be approximately 6.1 MMBF.

2.7 Comparison of Environmental Effects

Indicators of Effects	Alternative I	Alternative II	Alternative III	Alternative IV
Diversity within project area				
Distribution of structural stages of conifer	no change	enhanced	enhanced	enhanced
Abundance of aspen stands	decrease	maintain	decrease	decrease
Age-class distribution of aspen	all mature	well-distributed	all mature	all mature
Abundance of aspen sprouting	decrease	increase	decrease	decrease
Forest Health				
Acres treated for insects	0 acres	256 acres	256 acres	256 acres
Rank of the probability of a stand replacing fire within the project area (1 = low, 4 = high)	4	*3*	*3*	*2*
Fire suppression capability	no change	enhanced	enhanced	enhanced
Wildlife				
Abundance of subalpine fir type (important to moose)	increase	increase	increase	increase
Aspen acres enhanced	0 acres	28 acres	0 acres	0 acres
Riparian/wetland acres enhanced	0 acres	30 acres	0 acres	0 acres
Abundance of browse types other than aspen	decrease	increase	increase	increase
% Hiding cover in diversity unit (minimum standard is 40%)	All	alternatives	meet 40%	standard
Connectivity of travelways	maintained	maintained	maintained	maintained
% Thermal cover in diversity unit (minimum standard is 20%)	20.4%	20.2%	20.3%	19.6%
Habitat effectiveness and change in secure habitat	no change	enhanced yearlong in project area	enhanced in spring/winter project area	enhanced yearlong in diversity unit
Change in grizzly habitat value	decrease	increase	increase	increase
Change in secure habitat	no change	increase	decrease	increase
Roads and Access				
Open roads (standard is no net increase)	no change	minus 3.86 mi yearlong	minus 3.86 mi seasonally	minus 11.28 mi yearlong
Roads - new construction	0	0.69 miles	0.69 miles	0.69 miles
Roads reconstructed	0	0.49 miles	0.49 miles	0.49 miles
FSR roads decommissioned	0	0.78 miles	0.78 miles	0.78 miles
Unclassified roads decommissioned	0	0.32 miles	0.32 miles	0.32 miles
Access restrictions Yearlong closure to public Seasonal closure to public	 0 0	 3.86 mi 0	 0 3.86 mi	 11.28 mi 0
Net change in amount of roads	*0*	*minus 0 .41 mi*	*minus 0.41 mi*	*minus 0 .41 mi*
Commercial Outputs				
Sawtimber (volume estimated)	0	5.6 MMBF sawtimber	5.1 MMBF sawtimber	6.1 MMBF sawtimber

Figure 6. *Effects indicators, by alternative.*

Chapter 3 Affected Environment and Environmental Consequences

3.1 Introduction

The purpose of this chapter is to describe the environmental base line or current physical and biological characteristics of the environment that could be potentially affected by the proposed action and the alternatives to it, as defined by the significant issues and required subject discussion.

By using the existing conditions as a basis for comparison, one can determine the degree that each alternative can influence a change from the existing condition toward attainment of most desired conditions.

This section also describes potentially affected Forest Plan Management Indicator Species, designated Region 2 sensitive species, as well as proposed and listed species and their habitats. Both the affected environment and environmental consequences (effects analysis) are included in this chapter. Only the resources that were determined to be potentially affected are identified and analyzed in detail, to narrow and focus on the issues and resources disclosed in Chapter 1.

The affected environment generally is limited to the project area, but adjacent areas that could be potentially affected are also described where necessary and appropriate.

This chapter is organized by resource or resource characteristic. Each resource described in depth in this section was of major concern, as determined by the identification of the significant issues. The discussion of each resource will include a short discussion of the subject of the issue, specific Forest Plan direction relative to the resource, a description of the existing condition of the resource, and any restoration or enhancement opportunities that may exist. This chapter focuses on the following:

- Discloses the minimum acceptable conditions that are to be maintained and the conditions we are striving to achieve within this area. When comparing the existing conditions to minimum acceptable conditions, or to desired conditions to be achieved, opportunities that may exist for restoration and enhancement are surfaced. *If the existing conditions are presently below the minimum standard as defined in the Forest Plan (substandard), or in a downward trend, such a condition is not a justification for no action – on the contrary, management action to maintain or move toward the minimum acceptable condition (restoration) is directed. If existing conditions are above the minimum standard, and opportunities exist for moving toward a more optimum, or the specified desired condition, capitalizing upon such enhancement opportunities is directed.*
- This chapter displays the probable environmental consequences of implementing each alternative on resources of concern. It provides the scientific and analytic basis for the comparisons of alternatives
- The direct, indirect, and cumulative effects of the proposed action and alternatives to it are disclosed in this section for each potentially affected resource. The need for both project and landscape design standards are justified and displayed relative to the potential effects. Cumulative effects for each resource area are disclosed separately under that title at the end of this chapter.
- The effects are conveyed by an assessment of how well the alternative meets the essential purpose and need for action (e.g., enhances vegetative diversity and habitat value of indicator species (ruffed grouse) by increasing abundance and age-class distribution of aspen).

- Environmental effects are displayed in the context of short-term and long-term. Short-term effects relate to a period of five years or less. Long-term effects relate to a period of 30 years. Any discussion of effects beyond that time will specify the period.

The interdisciplinary team relied on literature reviews, published research findings, the Shoshone National Forest GIS data base, consultation with other experts and specialists, assistance from cooperating agencies and groups, and their professional training and experience to estimate the consequences of the alternatives considered in detail.

3.2 Vegetative Diversity

Diversity is meaningful only in the context of clearly defined management objectives. It is important to note that increasing vegetative diversity is not always an appropriate objective, especially relative to wildlife management. Beyond some point, an area's heterogeneity tends toward homogeneity. The pieces become so small and mixed that they assume sameness and are not useful as habitat (USDA Handbook # 553).

In the context of biological diversity, diversity is a factor of not only the variety, but also the distribution and abundance of different plant and animal communities and species (CFR 219.3). Vegetation diversity is important as an indicator of forest health, which relates to a variety of habitats for vertebrate and invertebrate animal communities, visual diversity for the forest visitor, and resistance to, and resilience in response to rapid, large scale changes over the landscape. "Management can influence vegetative diversity only by controlling plant succession in the right direction at the right time and place (Leopold 1933)."

Vegetative diversity can be defined or evaluated by a number of characteristics including:

- Vertical structure within individual patches/stands (vertical stratification of vegetation)
- Geometric structure of individual patches/stands (size, shape, edge amount)
- Composition or horizontal structure within a landscape (the variety and amount/abundance of species or types and/or variety and amount/abundance of seral stages or age classes). The number of vegetative types within an area is generally constant, although the abundance (amount) of any type may change. What does, and can be changed significantly is the variety and abundance of differing seral stages.
- Distribution or scattering of patches/stands of differing types or seral stages within a landscape

Any management influence relative to controlling vegetative diversity and its related factors such as wildlife species diversity, habitat, forest health, and susceptibility to disturbance factors is largely a matter of understanding and controlling vegetative succession. Control of succession for management purposes is accomplished by purposeful design and manipulation of vegetative patches to achieve desired composition, structure, and patterns over a landscape.

3.2.1 Forest Plan Direction Relative to Diversity

Forest vegetation diversity and the associated wildlife species diversity are best judged by taking a landscape view. A diversity unit of approximately 15,767 acres was designated to analyze effects and meets the size requirement for diversity units under the Forest Plan. The area considered is shown in Figure 5 in Chapter 1. The extent to which proposed vegetation treatments affect this mix of vegetative types, seral stage, and patch structure and distribution is the extent to which vegetation diversity may be affected or enhanced.

One of the Forest Plan goals is to improve tree age class and species diversity to benefit forest health, recreation experiences, visual quality, and wildlife habitat (III-8). Natural shrub and grassland openings are to be maintained (III-176), the aspen type is to be retained wherever it occurs (III-21), and riparian ecosystems are treated to improve wildlife habitat through specified silvicultural objectives (III-207).

The Forest Plan (III-19) also provides minimal landscape design standards for structural diversity: maintain or establish a minimum of 20% of the forested area in a unit in vertical diversity, 30% in horizontal diversity, 5% in grass/forb stage, and at least 10% of the potential natural vegetation in old growth.

Also, minimal project implementation design standards require retaining six to 10 snags per 10 acres, well distributed throughout the diversity unit (III-20). Recent data (Saab and Dudley 1998) indicate retention of clumps of snags rather than uniformly distributed snags would most benefit the entire cavity-nesting bird community. Standards (III-20) also require retention of dead-down logs where biologically feasible (10 inches in diameter and 33 linear feet/acre in aspen and lodgepole pine, 12 inches in diameter and 50 linear feet/acre in Douglas-fir and spruce/fir). Because the areas of treatment are mixed species stands, the standard for this project will be 10 inches in diameter and 50 linear feet/acre of dead and down. The acreage of each of the major forest vegetation types in the diversity unit, as well as the acreage within each structural stage (age class) is shown below.

For a related discussion of forested wildlife habitats, *see* Wildlife Affected Environment.

3.2.2 Existing Condition Relative to Diversity

Within the Diversity Unit

The Forest Plan requires the sustainability of vegetative structural diversity, vegetative type diversity, and habitat for wildlife indicator species on units of land 5,000 to 20,000 acres in size (called a diversity unit).

The Forest Plan also dictates minimum landscape design standards for vegetative diversity within a diversity unit. The 15,767-acre diversity unit for this analysis is composed of a variety of forested habitats. The following table displays the existing timberland diversity components in comparison to those diversity minimum standards contained in the Forest Plan.

Vertical Diversity Multi-age Structure	**Horizontal Diversity** Even-age Structure	**Grass/Forb** Seral Stage	**Old Growth** Seral Stage
Forest Plan 20% Existing < 10%	Forest Plan 30% Existing > 90%	Forest Plan 5% Existing 27%	Forest Plan 10% Existing 24%

Figure 7. *Existing timberland diversity components in comparison to those diversity minimum standards contained in the Forest Plan.*

As can be concluded from Figure 7, the proportion of existing uneven-age timber stands having vertical diversity (complex vertical structure with multiple age classes and multiple layers) is well below the *minimum* standard. Also evident is the fact that the proportion of even-age stands (stands having only a few age classes or layers of vegetation) contributing to horizontal diversity between stands across the landscape is well above the desired condition. This skewed mix is due to several factors, and little opportunity exists to affect it in either the short-term or the long-term. The primary cause of this imbalance is due to site conditions.

The majority of remaining timbered stands is located on drier sites that favor Douglas-fir, and growing conditions (moisture, shading, competition, etc.) favor even-age characteristics. The other contributing cause is the fire of 1988, which burned many even-age stands of Douglas-fir and

lodgepole pine and some multi-age stands of spruce/fir setting them back to grass/forb seral stage, or single age class stands. The only remaining stands containing complex vertical structure are the older and more mesic spruce/fir stands. These stands were limited before the fire based on site conditions, and are in limited supply today with most containing very old high-risk trees as their upper structural component.

Catastrophic disturbance from insect infestation and stand replacing wildfire tends to cause multi-age stands to be converted to early seral (grass/forb) even-age timber stands. The remaining old-age spruce/fir stands in the project area are at risk of being converted to even-age stands because of their vulnerability to both insects (spruce bark beetle) and wildfire. One of the worst scenarios relative to maintaining spruce/fir stands having complex vertical diversity in this area is to allow these remaining stands to be set back to early seral stages as a result of natural disturbance. Not only are these stands providing vertical diversity, they are quickly becoming the primary sources of tall forested cover in the area due to the loss of tall cover in the Douglas-fir stands from to insect mortality. To lose all the vertical diversity of these stands by allowing natural disturbance to set them back to early seral stage would have catastrophic effects on both overall vegetative diversity and well as on many dependent wildlife species.

The vertical diversity condition is declining and is below the minimum standard (substandard) relating to the proportion of forested area to be maintained in vertical diversity. This minimum standard cannot be met for decades into the future, either with or without management. Management can accelerate the restoration of vertical diversity by encouraging regeneration and retaining a portion of the overstory. This can be done by implementing a preventive management strategy that reduces the number of intermediate-age trees killed in the long term from insect/disease infestation and stand replacing wildfire by removal of the remaining highly vulnerable insect brood trees and reduction of the continuity of fuels. This is best accomplished by selective sanitation and salvage harvest, in conjunction with fuel reduction treatments deemed necessary and appropriate for this area at this time.

The potential consequence of inaction is the loss of ecological integrity over this landscape. Removal of a portion of the upper tier of these multiple tiered stands, to prevent the potential loss of all the tiers contributing to vertical structure and providing cover characteristics for many purposes, appears to be the prudent course of action from a long-term ecological perspective.

National Forest Lands within the diversity unit (15,767 acres) are composed of the following:

- 15% (2,313 acres) is non-forested or sparsely forested
- 85% (13,454 acres) is forested
- 28% (4,434 acres) of forested area in the diversity unit burned in 1988

Existing seral stages of forested area (including burned forestland)

- 27% (3,647 acres) grass-forb seral stage
- 1% (140 acres) shrub-seedling seral stage
- 3% (368 acres) sapling-pole seral stage
- 45% (6,088 acres) mature seral stage
- 24% (3,211 acres) old growth seral stage

5,195 acres of the forested area within the diversity unit are within the suited base

- 2,170 acres (42%) of the suited base burned in the Clover Mist Fire of 1988

Within the Project Area

Analysis considered composition, distribution, positioning, linkage, and the overall landscape pattern of vegetation within the project area. This was done to ensure that plant and animal diversity is at least as great as that which would be expected in a natural forest, to ensure habitat distribution such that animals can interact with others, and to ensure that plant diversity is meaningful to all wildlife species when considering habitat requirements and habitat quality.

The forested stands within the 1,217-acre project area are a mixture of single and multiple canopied stands, in a mature to over-mature seral state with the exception of the previous clear cut. The majority of stands are composed of Douglas-fir and spruce/fir types. The Douglas-fir type stands, which comprise approximately 24% of the timbered stands, are relatively pure with only scattered occurrences of Engelmann spruce and lodgepole pine. The lodgepole pine type (1.2 %) occurs in relatively pure stands in the old clear cut and as a minor component in the other timber types. Spruce/fir stands occupy approximately 27% of the forested area. These spruce/fir stands tend to be largely stocked with Engelmann spruce with some subalpine fir and scattered Douglas-fir and lodgepole pine. The non-forested portion is approximately 46% of the area.

Because the existing data was collected several years ago, it is not totally accurate due to the accelerated level of insect infestation. Because of this time lapse since data was collected, stand data relative to canopy coverage is less than shown in existing data. Therefore existing canopy coverage estimates were based on field observation. Overhead canopy coverage that presently exceeds 70% exists on approximately 60% of the forested type in the project area. Canopy coverage is rapidly decreasing on the Douglas-fir stands on the upper benches, and is expected to stabilize at less than the 25% level.

3.2.3 Diversity Enhancement Opportunities

There are several *restoration and enhancement* opportunities within the project area for changing from existing condition toward more desirable conditions relative to diversity of vegetation. In addition to opportunities for immediately enhancing the aspen type, which is discussed in the following section, there are also immediate opportunities for enhancing: 1) the 21-acre wetland/riparian type and its associated vegetation; 2) the areas occupied by desirable shrub species such as willow, alder, and buffalo berry, etc.; 3) the native interior meadows by reducing encroachment; and 4) the abundance and distribution of lodgepole pine, which is a very limited species in the area.

Although there are many early succession coniferous stands in the diversity unit, there are opportunities in the long-term for enhancing interspersion or distribution of seral stages by silvicultural treatment within the project area. There are also some indirect opportunities for maintaining some level of structural diversity by reducing future hazards from insects and wildfire within the project area. There is little opportunity for changing the abundance or distribution of the conifer types, except for lodgepole pine, within the area due to existing site conditions and stand conditions.

3.2.4 Effects on Vegetative Diversity

The percentage of old growth stands within the project area that would receive no treatment is the same for all alternatives. These untreated stands of old growth remaining in the diversity unit are of sufficient amounts to meet the Forest Plan minimum requirement of 10%, and distribution of old growth stands within the project area are sufficient to provide adequate habitat for old growth dependent species that use the project area.

Alternative I

Vegetative type diversity within the project area would continue to decline, and deciduous species such as aspen, alder, birch, and willow would be well below their biological potential. Although the variety of types would remain the same in both the diversity unit and project area, the abundance and distribution of deciduous species such as aspen, willow, and early seral coniferous species such as lodgepole pine would continue to decline as the area moves toward a spruce/fir climax. With Alternative I, conifer encroachment into the edges of wetlands, deciduous seral types, and meadow communities would continue until natural disturbance factors (primarily fire) set back succession.

Left to natural succession, stands of Douglas-fir and lodgepole pine in the area would give way through natural succession to Engelmann spruce and subalpine fir climax types thus also leading to a decline in diversity relative to species abundance. Vertical structure (and the vertical diversity) of individual timber patches dominated by Douglas-fir within the project area would decrease in the short-term due to loss of the overhead canopy to insect mortality. Based on observations of stands infested in the late 1980s, with Alternative I natural disturbance by insect infestation would reduce canopy closure in the long-term by 75-80%.

Visually, under this no action alternative, in the short-term a tremendous increase in standing dead trees killed by insects and diseases would be evident. In the long-term these dead trees would decay and fall to the ground adding substantially to the dead/down diversity component but also adding to the fuel-loading problem that already exists in this area.

Natural thinning, when occurring within limited-aged stands (only one or two age classes) of mature and over mature timber, initiates regeneration of the stands of shade tolerant species such as Engelmann spruce and subalpine fir. Douglas-fir regeneration could become established in stands that are heavily thinned by insects/disease. Lodgepole pine would be eliminated from the stands due to competition from the more shade tolerant species. Regeneration results in early age classes thus contributing to additional strata in the understory. Structure would become more complex over the long-term. Vertical diversity would continue to increase from stand establishments until the stands reach maturity.

Recruitment of large snags within many stands, in both the short-term and long-term, contributes to the diversity (abundance and distribution) of this component within those stands. Also contributing to the complexity of the strata within stands would be the large amount of large dead and down material that results from the falling dead overstory trees. In both even-aged and all-aged stands, the amount of dead and down component would continue to accumulate, thus enhancing components of an old growth forest. Such excessive amounts of large down material would have the indirect effect of restricting movement of large ungulates in many areas, and adding to fuel loading in the project area.

Horizontal structure relative to changes in age-class distribution within the project area would change dramatically over the long-term resulting from the loss of the overhead canopy in many areas. Structure resulting from a preponderance of earlier age classes would dominate the areas that are presently dominated by older age classes. The same disturbance factors in multi-canopied stands would cause little change except that natural loss of the large overhead canopy trees would stimulate some regeneration, thus causing continuation of multi-age vertical diversity.

Alternative II

Implementation of Alternative II would cause many of the same changes as expected in Alternative I, especially with regard to loss of the overhead canopy and a surge in new regeneration in coniferous stands. The effects of this proposed action accelerates this change by the use of timber harvest as a management tool, as compared to Alternative 1 that allows events such as insect and disease infestations and wildfire to manage the stands of timber in the project area. The use of

sanitation and salvage harvest as the primary management tool changes the nature of the treated stands of timber and deciduous vegetation from a mature forest to an earlier successional forest by removing the dead and soon-to-be dead overstory trees. Additionally, conifer encroachment into the edges of wetlands, aspen, and meadow communities would be reversed by the removal of conifer encroachment from these areas to set succession back.

The abundance of differing age classes and distribution of stands of differing age classes within the project area would increase. Horizontal structure of coniferous types within the project area would be enhanced, and vertical structure of many coniferous stands would change because of the loss of the overstory structure and a more complex structure in the understory. There would be major change on the abundance and distribution of types of minor vegetation species. Due to the removal of conifers from decadent aspen stand, wetlands and encroached meadows, minor vegetation species such as aspen, alder, birch, and willow would increase in vigor and abundance. There would be an increase in the abundance of early succession lodgepole pine due to the treated stands being open enough to allow sunlight into the stands to promote the establishment and growth of serotinous lodgepole, which would increase species diversity. The existing seedling, saplings, poles and young mature Englemann spruce, subalpine fir and Douglas-fir would increase in size and vigor due to the removal of the infected/diseased overstory trees which would make more water and nutrients available to the remaining live vegetation on the treated sites.

The abundance and distribution of deciduous species (trees and shrubs) would be enhanced by the removal of conifer encroachment in the meadow and wetland areas. The amount of old growth would decrease, although some stands of old growth would be maintained throughout the area, and connectivity would be maintained by retention of linkage corridors (non treatment areas). The abundance and distribution of snags, dead and down material, and old growth would be much less as compared to Alternative I, because much of the material would be harvested and removed from the treatment areas under this alternative.

Although the interspersion and juxtaposition of types (and to some degree age classes) can be enhanced by conscious design in any of the treatment alternatives, this alternative has the highest degree of potential for enhancement relative to arrangement as more vegetative types are being manipulated.

Within the treatment areas, low shrub species and forage production would increase over the next several decades. After that, forage production should decrease as tree canopies begin to close and prohibit light from reaching the forest floor. More complex shrub species such as alder, willow, and birch would be maintained at levels for five or more decades.

Alternative III

The effects of Alternative III on horizontal and vertical structure, snags, dead and down, and old growth are similar to the proposed action. The use of sanitation and salvage harvest as the primary management tool changes the nature of the treated stands of timber and deciduous vegetation from a mature forest to an earlier successional forest by removing the dead and soon-to-be dead overstory trees. Within the treatment areas, low shrub species and forage production would increase over the next several decades in the treated areas. After that, forage production should decrease as tree canopies begin to close and prohibit light from reaching the forest floor.

Since Alternative III treats only the conifer stands, no treatments would occur in the decadent aspen stands, wetlands, riparian areas and meadows; the deciduous component in the project area would not be affected under Alternative III. The decadent stands of aspen would be crowded out by conifer encroachment, the wetlands, riparian areas and meadows would diminish in size and vegetative composition would continue to move toward climax conifer tree stands dominated by

Englemann spruce and subalpine fir. Without disturbances in these areas, these important vegetative species and areas would continue to decrease due to vegetative succession.

Horizontal structure of coniferous types within the project area would be enhanced, and vertical structure of many coniferous stands would change because of loss of the overstory structure and a more complex structure in the understory. There would be little change on the abundance and distribution of types in that there would be no initiative to enhance abundance or distribution of minor vegetation species. There may be a slight increase in the abundance of early succession lodgepole pine, and existing aspen would be maintained for a slightly longer period due to less competition resulting from conifer removal, but only in the short-term.

Alternative IV

The effects of Alternative IV on horizontal and vertical structure, snags, dead and down, and old growth are similar to the proposed action, Alternative II. The effects of the proposed action accelerate this change from primarily mature forest to earlier succession by removing dead and soon-to-be dead overstory trees, using the tool of timber harvesting. This alternative emphasizes enhancing productivity for sawtimber growth, by improving forest health as it relates to insects and diseases and to reduce forest fuels in the treatment areas to reduce fire intensity and damage to the conifer trees in the area. This alternative would reduce the basal area of conifer trees in the treated stands (size and number of trees) to a lower level than in the proposed alternative.

A shelterwood harvest prescription would be applied to the majority of timber stands in the project area. Some sanitation and salvage harvest would occur along with release and thinning to assure proper spacing, to eliminate poor growing stock and to enhance individual tree vigor, and to reduce the potential for future insect and disease attacks.

Group selection or a modified group shelterwood prescription may also be used to open stands more (allow more light into the stand to allow the regeneration of serotinous lodgepole pine) to allow the reestablishment of lodgepole pine within the project area. Only merchantable sawtimber size trees would be removed from aspen stands, areas adjacent to wetlands and riparian areas, and meadows. No sub-merchantable conifer trees would be removed for these areas. Within the treatment areas, low shrub species and forage production would increase over the next decades in the treated areas. After that, forage production should decrease as tree canopies begin to close and prohibit light from reaching the forest floor.

Since Alternative IV treats only the conifer stands, the decadent stands of aspen would be crowded out by conifer encroachment, and the wetlands, riparian areas and meadows would diminish in size and their natural hydrological process would become less efficient overtime. The vegetative composition would continue to change into climax conifer tree stands dominated by Englemann spruce and subalpine fir. Without management disturbances in these areas, these vegetative types and areas would continue to decline due to vegetative succession. There would be little change on the abundance and distribution of types in that there would be no initiative to enhance abundance or distribution of minor vegetation species. There should be an increase in the abundance of early succession lodgepole pine. Aspen would be maintained for a slightly longer period due to conifer removal, but only in the short-term.

Horizontal structure of coniferous types within the project area would be enhanced, and vertical structure of many coniferous stands would decrease because of loss of the overstory structure and a more complex structure in the understory. However, the effects of this alternative on those coniferous areas being treated are of the greatest magnitude in the short-term relative to the reduction in the amount stems, the reduction in overall canopy cover, and reduction in thermal and hiding cover. Over the long-term, horizontal structure (age-class distribution) would be the greatest with this alternative.

3.3 Aspen

This discussion is based on USDA General Technical Report RM-119, 1985 Regional Guidelines for Managing Aspen, and reports specific to aspen on the Shoshone NF by Gordon Gullion.

Aspen is generally classified within two general types. One type is self-perpetuating aspen, which is multistoried and regenerates without major disturbance, and is sometimes referred to as indeterminate aspen. There is very little of this type of aspen on the northern portion of the Forest. The other type of aspen, which is the dominant aspen type on the Forest, is referred to as determinate or even-age aspen, and is a seral community within a coniferous forest type. Although both types can be encroached upon by other species, the even-aged or determinate stands are at highest risk for elimination from an area, as they require major disturbance to regenerate.

Individual aspen stands are a single plant with many stems called a clone. Due to their early seral status, most aspen clones found within later-seral forested areas are in a mature state with few young stems called suckers. Due to competition from conifers, the clone itself cannot expand in size, or regenerate itself.

In addition to the encroachment and competition from later seral conifer species, the clone has inherent characteristics that hinder sprouting. Older and larger stems within an aspen clone produce auxins (hormones) that retard regeneration by suckering. Without major disturbance factors such as fire, flood, mechanical treatment, etc. that kill the larger stems, degeneration of even-aged clones continues over time until they eventually die out.

Rocky Mountain aspen reproduce almost exclusively by suckering, although establishment of new clones by seedlings does occur occasionally. Clear cutting is generally the most appropriate mechanical treatment method. This is because it promotes the most suckering. Partial cutting is usually limited to stands that have already shown some regenerative response following a previous disturbance to the overstory.

3.3.1 Forest Plan Direction For Aspen and Other Deciduous Vegetative Types

Goals for aspen are in Section III, pages 6-10.

- Improve the health and vigor of vegetation types.
- Manage fish and wildlife habitats, including plant diversity, to maintain viable populations of all species and meet population objectives of Management Indicator Species. Aspen was one of the major vegetative types for which indicators were selected, and the primary indicator species relating to aspen is the ruffed grouse, as it is representative of multi-storied aspen communities. Ruffed grouse do exist in the Deadman Bench project area.
- Improve habitats where vegetation conditions are significantly below biological potential.

Forest Plan forestwide direction (III-19-98), and management area direction (III-99-250) contain the following direction relative to required standards and guidelines.

- Maintain structural diversity of vegetation. Manage aspen for retention wherever it occurs, unless conversion to conifers is justified for other reasons (III-21).
- Management Area Goal 4D applies, which states that aspen is to be maintained and improved wherever it occurs in order to produce wildlife habitat, wood products, visual quality, and plant and animal diversity (III-153).
- Maintain aspen clones. Vary location of treated clones to maintain natural-appearing diversity of age classes (III-154).

- Manage aspen forest cover type to perpetuate aspen using even-aged silviculture. The appropriate regeneration treatment method is clear cut for aspen (III-55, III-53, III-59, III-64, and III-207).
- If determinate aspen stands are managed for regeneration, treat contiguous areas no larger than 40 acres. Treat entire clones (III-21).
- Closely manage grazing by domestic livestock in treated aspen stands until regeneration is six feet tall. Where there has been manipulation to induce aspen regeneration, do not allow aspen seedlings to be grazed by livestock more than one out of three years (III-155).

Although not a part of the Forest Plan, the Canada Lynx Conservation Agreement and the Canada Lynx Conservation Assessment and Strategy, which the Forest Service is a party to, provide direction relative to aspen. "Young, densely regenerating aspen stands with a well-developed understory provide good quality habitat for snowshoe hares and other potential lynx prey species, such as grouse." Page 7-6, standard 4 directs the agency to apply harvest prescriptions that favor regeneration of aspen.

3.3.2 Existing Condition of Aspen in the Diversity Unit

The aspen vegetative type is a very limited type in most areas of the Shoshone National Forest, generally comprising less than 4-5% of the forested vegetation types, even at its maximum potential. Within the project area aspen covers approximately 28 acres. The total acreage dominated by aspen, and number of patches dominated by aspen type within the timbered area of the Deadman Bench, is declining and well below potential, as is the density of suckering stems in most clones. The distribution of age classes (horizontal diversity) is totally skewed toward mature and old growth age classes, with no young or early age class clones within the project area.

Conifers presently dominate most clones. Without major disturbance such as fire or mechanical treatment to set back succession, conifers will continue to replace most clones located within the later successional stages of forested areas. Conifer encroachment is occurring in most of the aspen clones located at the edge between timber and meadow types, and several interior clones are in threat of loss in the short-term. Several open grown clones are in threat of loss within the next several years.

Within the burned areas adjacent to the project area, many aspen clones were regenerated, and reverted to early seral structural stage because of the 1988 fires. As aspen is at an early seral stage of succession in the majority of cases in this burn area, it appears that over time many of these clones will increase in both density and size, and a few new clones can be expected to regenerate from adjacent seed sources outside the burn.

Of major concern relative to aspen is the juxtaposition of stands. This is because aspen obligate species such as ruffed grouse require many age classes of aspen for their existence, and their cruising radius during critical periods and home range is relatively small (several hundred acres). Distribution of required types or age classes over a 15,000-acre diversity unit may appear well-balanced, and may meet standards for vegetative diversity in general, but without proper positioning of differing habitat components relative to the cruising radius of dependent species, the obligate species cannot be sustained in an area.

Relative to concerns about overuse of aspen regeneration by wildlife and cattle, there are approximately three acres of aspen immediately adjacent to the project area that were regenerated by cutting in 1983. These clones are located to the left and below the rim near the power line as one starts up the Deadman Bench Road. Since treatment, those clones have been accessible to both cattle and wildlife. Sprouting is of high density and from eight feet to 15 feet in height, and regenerating very well. Several other very small clones along Deadman Creek within the project

area were also cut at the same time. Only a few (<10) large stems remained and no encroaching conifers were removed. Regeneration of these stands was unsuccessful, but it appears this was due to the extremely poor condition of the clones – not overuse by ungulates.

In summary, the aspen type is very limited in most of the study area, including both inside and outside of the burn area, and the potential for the aspen type in general is quite limited. The majority of aspen clones in the burn area is early succession and possess little vertical or horizontal structure, whereas clones within the unburned timbered areas are decadent, declining in size, and being squeezed out by conifer encroachment and competition.

3.3.3 Aspen Enhancement Opportunities

There are several restoration opportunities associated with this proposal for reversing the downward trend of aspen. Maintenance and enhancement opportunities exist for expanding the amount of aspen type, providing a more diverse distribution of structural stages, and increasing the amount of regeneration of new growth of individual clones within the project area. In those situations where aspen clones are located within timber stands or located within the edge immediately adjacent to coniferous stands, and when these clones contain commercial coniferous species of merchantable size, those trees can be removed by commercial means.

In addition, in those stands not containing commercial coniferous species of merchantable size, the KV plan associated with this proposed treatment can specify and schedule aspen enhancement treatments for both conifer removal and direct regeneration treatment as necessary and appropriate to meet the stated multiple use objectives.

The one major concern relative to aspen treatment that must always be considered relative to direct treatment of aspen is the protection of regeneration from overuse by both livestock and wildlife. Although not a major concern when evaluating previously regenerated stands adjacent to the project area, protection of aspen regeneration is a design requirement, and standard operating procedures for protection of regeneration for any aspen treatment would be implemented relative to this proposal.

3.3.4 Effects on Aspen

Alternative I

With Alternative I, which allows no vegetation manipulation, either with encroaching conifer or direct regeneration of aspen clones, the abundance (acreage), distribution, and overall condition of aspen clones can be expected to continue to decline within the project area until a catastrophic disturbance by wildfire occurs. Many aspen clones would likely be lost if such disturbance does not occur in the near future. This is a result of competition from conifers for light, moisture, and nutrients, and the inability of the majority of the aspen clones to regenerate without the presence of major natural disturbance to counteract apical dominance.

Alternative II

Alternative II enhances the amount and structure of aspen in the project area as it has the goal of purposefully enhancing aspen by reduction of conifer encroachment and direct regeneration treatment of aspen clones at risk. With reduced competition from conifers due to removal of encroaching conifers, and regeneration of aspen clones where appropriate, both the size of clones and the density of stems within clones would increase. Distribution of the aspen type would be maintained. With purposeful scheduling of regeneration in the future to achieve a variety of age classes per unit area, distribution of age classes (horizontal structure) of clones would also be enhanced. Establishment of numerous vigorous suckers (6,000 to 12,000 per acre) would be expected in regenerated clones.

Alternatives III and IV

Alternative III and Alternative IV would maintain the many of the healthier existing clones for several decades due to a decrease in competition from coniferous species. Opening up the coniferous forest canopy would enhance aspen and shrub species to a limited degree. Several clones presently in very poor condition (decadent with few remaining stems) would most likely die within the next decade. The majority of clones would likely disappear in the long-term without major disturbance.

3.4 Forest Health

Forest health relates to a general condition of the land and its related resources. The goals of stewardship management are to maintain the land and the related resources in a healthy condition in order to maintain sustainability of the total ecosystem over time. This implies management in which natural processes, structures, and functions are fully functional. It also implies maintaining vegetation and other resources in a condition that minimizes the risk of catastrophic natural disturbances. Resources (i.e., timberland, rangeland, wildlife, etc.) that are managed in a healthy condition function properly and are much more resistant to disease and mortality factors, and being more resilient when major disturbance events occur.

As forested ecosystems mature, they become more susceptible to severe fire and outbreaks of insects and disease. Reducing the risks and hazards of such natural disturbance events on human values involves maintaining forest cover and structure within a range that considers long-term disturbance processes. Long-term, large-scale disturbance regimes such as stand replacement fire or insect infestations occur naturally when vulnerable vegetative conditions and extreme stressful regional or global weather patterns such as drought coexist. Although such natural processes are beneficial ecologically, they can cause very detrimental effects socially and economically when occurring on a large scale. Although such disturbance events cannot be controlled on a large scale, preventive practices can be very beneficial in smaller scale, high-value social and economic areas. Such practices can prevent catastrophic adverse social and economic effects on select areas while allowing human uses of resources.

Timber harvest can be used as an effective preventative tool to reduce risks of severe wildfire and insect and disease epidemic outbreaks on a small scale by returning stands to more appropriate species mixes, densities, seral stages, and patterns that are not as susceptible to catastrophic disturbance events that affect the total area. The scope of activities to achieve timber age class goals or protection from insects and disease must be regarded as local in nature than of forest-wide consequence (Forest Plan III-6).

Forest health as addressed in this section is specific to health of forested vegetation relative to insect infestation and wildfire. Other resources are addressed in separate sections.

Insect Infestation

Epidemic levels of insect infestations are natural thinning processes associated with old age or highly stressed forestland. Two options exist for treatment dealing with epidemic levels of pest organisms: prevention to forestall pests from reaching epidemic levels, and treatment after epidemic levels of infestation has occurred.

The primary purpose of treatment after an epidemic infestation has occurred is generally only to salvage any usable products, to reduce the risks of wildfire, or for restoration purposes relating to high value resources, wildlife, visuals, etc. The purpose for initiating treatment, and the design of treatment is not insects per se, but other resource concerns relating to the existing or potential stand conditions.

In order to prevent the spread of epidemic levels of insects in the short-term when considering silvicultural methods, one must stay ahead of the infestation. Stands adjacent to infestation areas must be treated to the degree that all potential host trees are removed. This is not a realistic strategy on large areas or in the long-term. This is because there is no realistic way to stay ahead of an epidemic infestation if one has a monogamous continuum of late succession decadent vegetation such as exists in many timbered areas of the Forest.

On the other hand, treatment as a means of prevention must be viewed on a landscape scale in the long-term, and on a patch or stand basis in the short-term. The most desirable condition relative to forest health, when considering the hazards associated with insects, is to have a diversity of vegetative types and age classes in variable sized patches distributed throughout a landscape. In addition, a majority of these patches should be in a vigorous healthy condition.

The following discussion pertains specifically to Douglas-fir beetle, the primary pest species of concern in this area, and is based on a summary of conditions by McMillin and Allen (2000). Typically, the beetle reproduces in mature scattered trees that are highly stressed, such as windfall, defoliated, or fire-scorched trees. If enough suitable host materials are present, beetles can increase in the stressed trees and infest nearby healthy trees having inherent high-risk characteristics. Beetle infestation can have a significant impact on forest overstory conditions and the amount of dead material within a heavy infestation area.

The Douglas-fir beetle (*Dendroctonus pseudotsugae*) infests and kills Douglas-fir trees. High-risk trees are those trees having the following characteristics (Schmitz and Gibson 1996):

- 16 inches or more in diameter (down to 12 inches in heavy infestation areas)
- Mature or over mature
- Occur in high-density stands containing a high percentage of Douglas-fir in the overstory
- Occur in stands with high basal area

If major infestation has not already occurred, sanitation and shelterwood seed-cut harvest methods provide a high degree of protection to adjacent stands at risk by removing potential high-risk host trees. Sanitation harvest treatment can reduce the hazards from insects within treated stands and those immediately adjacent, by removing overstory trees which are infested with Douglas-fir beetles and those that are highly susceptible to attack (mature/over mature, decadent, trees over 16 inches diameter at breast height).

Growth rates of understory trees within stands treated by sanitation/salvage can be expected to increase with removal of competing high-risk overstory trees. This sanitation action can reduce the spread of insects, ultimately creating healthier forested stands in the short-term. Silvicultural treatment that reduces the basal area below 80% of normal (live trees) also reduces susceptibility of Douglas-fir stands to Douglas-fir beetle attack, which may limit tree mortality and infestation size in the event of future increases in Douglas-fir beetle populations.

Fuel Loading

A recent report on the effects of various fuels treatments on wildfire severity indicates that treated stands, using methods similar to this proposal, experienced lower fire severity than untreated stands that burn under similar weather and topographic conditions (Omi and Martinson 2002). Catastrophic fires can put ecological integrity at risk. Management treatments to reduce the risk of severe fire are not without risk to ecological integrity either. By managing an area for proper species composition, stand densities, and landscape vegetative patterns, adverse effects can be reduced.

The primary factors that influence wildfire are fuel characteristics, topography, and weather. Changing any of these three elements can influence the effects of fire behavior.

The element that contributes to minimizing the risks of loss of resources as well as minimizing risks to property and human safety once an ignition has occurred is referred to as suppression capability. Suppression capability is dependent on response time, the type and availability of resources, fire rate of spread, and fireline intensity (which is again determined by the fuel type and characteristics, topography, and weather). Suppression capability can be enhanced by modifying fuel characteristics, shortening initial attack response times with improved roaded access for engines and hand crews, or the use of aerial resources such as smokejumpers, air tankers, and helicopters. The use of aerial resources is limited by availability and weather conditions and cannot be solely depended upon to provide suppression capability.

The probability of wildfires, fire behavior, and fire effects are based on predictive fire models. For this analysis the past 62 years of fire records were analyzed; BehavePlus was used to model fire behavior based upon current fuel characteristics, loading and weather observations; FOFEM (First Order Fire Effects Model) was used to predict the effects of wildfire for the current conditions and various activity fuel treatments to ensure tree mortality of the remaining trees was acceptable even if a wildfire should occur after treatment; and NEXUS, a fire behavior and hazard assessment spreadsheet, was used to model crown fire probabilities and the thresholds when the probabilities of crown fire exist

The major concern relative to the proposed project area is the potential for crown fire similar to what occurred in adjacent timberlands in 1988. A crown fire is dependent on the continuity of fuels in combination with favorable conditions. These conditions include: dry fuels, low humidity and high temperatures, heavy accumulations of dead and down litter, conifer reproduction and other ladder fuels, steep slope, strong winds, unstable atmosphere, and a continuous forest cover. A combination of any or all of these conditions can lead to a crown fire (Rothermel 1991).

As managers have no control over topography or weather, modifying fuel characteristics in conjunction with enhancing suppression capability are the primary defenses against wildfire risk in high value areas.

3.4.1 Forest Plan Direction For Forest Health

Insects

Improve the health and vigor of vegetation types outside wilderness (III-6). Consistent with the relative resource values involved, prevent or reduce serious, long lasting hazards and damage from pest organisms, utilizing principles of integrated pest management (CFR 219.27 (a)(3) and Plan III-97). Implement an integrated pest management program to prevent and control insect infestations and disease (III-8). Reduce damages by insect, disease, and other forest pests to acceptable levels through integrated management of vegetation (III-10). Prevent or suppress epidemic insect and disease populations that threaten forest tree stands with an integrated pest management approach (III-97).

Fuel Loading

Prevent or reduce serious or long lasting hazards from flood, wind, wildfire, erosion, or other natural physical forces unless these are specifically excepted, as in wilderness (CFR 219.27). Reduce the accumulation of natural fuels (III-8). Provide cost-effective fire protection to minimize the combined costs of protection and damages, and prevent loss of human life (III-10). Reduce or otherwise treat activity fuels so the potential fireline intensity of an area will not exceed 400 BTUs/sec/ft *(Burning Index 68)* on 90% of the days during the regular fire season. (III-96).

3.4.2 Existing Condition of Forest Health

Insects

The Clover Mist Fire of 1988 scorched and weakened many large diameter mature and over mature Douglas-fir trees in the Crandall area. As a result, Douglas-fir beetle moved into these areas with the infestation being at epidemic levels. This Douglas-fir beetle infestation has moved into many timbered areas adjacent to the fire area, and is currently infesting high-risk Douglas-fir trees in the project area and other areas within the diversity unit.

Overstory mortality and associated changes in the understory can be expected to continue until the beetle population collapses to endemic levels. The Douglas-fir beetle outbreak is expected to continue, but it reached its initial peak within the first three years after the fire, and the rates of spread are expected to decline to endemic levels in the near future in most areas, as most highly susceptible host trees will have succumbed to mortality. To date, mortality of high-risk trees within infested stands has ranged from 40% to 70%**.**

Douglas-fir beetle presents the most serious pest hazard within the project area, and has been at epidemic population levels since 1989. Significant effects of the infestation on infected stands to date include:

- Reduction in live basal area by 40-70%
- Douglas-fir overstory component reduced by 15%
- Decrease in live tree diameter by 8-40%
- Conifer seedling regeneration increased nearly four-fold
- Understory vegetation abundance increased three-fold

Douglas-fir beetle infestations, although causing significant short-term impacts in both the overstory and understory, probably do not change long-term successional patterns. The one exception where long-term succession may be significantly influenced is in the event of excessive fuel build-up occurring because of high mortality of large trees, and the occurrence of a resulting stand replacement wildfire. Although such a fire would most likely be within the range of natural variability, it would be extremely detrimental to attainment of both short-term and long-term stewardship objectives.

The overstory of Douglas-fir within the project area is over mature with many trees being in excess of two hundred years old. Though over mature, the Douglas-fir sawtimber that has not been attacked by the Douglas-fir beetle is relatively healthy with the exception of small areas where rot is resulting in heavy mortality through stem breakage.

Six biological evaluations documenting the progression of the outbreak population of the Douglas-fir beetle and the resulting tree mortality on the Clarks Fork Ranger District have been completed (Pasek 1990, 1991; Pasek and Schaupp 1992; Schaupp and Pasek 1993, 1995; McMillin and Allen 2000).

In addition, a general aerial detection survey of damage and mortality in forested stands caused by insects and diseases throughout Wyoming was conducted between July and September of 2000 by the USFS Region 2 and Wyoming State Forestry Division. The survey indicated that for Douglas-fir beetles, there are an estimated 25,800 dead trees covering nearly 7,500 acres within the area surveyed, which represents a 128% increase over 1999's figures of 11,300 trees, and a 36-fold increase since 1998. Nearly all of this mortality occurred in Park County (99%) within the northern Absaroka Mountains (USFS Region 2, Report LC-01-09). These reports are located in the project file.

Fuel Loading

Fire has played a significant role in shaping the character and development of this landscape. Fire evidence indicates that fires have been occurring frequently over much of the area. This being a higher elevation cool, moist subalpine forest, the fire regime (the nature of fire occurring over long periods and the prominent immediate effects of the fire) is classified as a mixed severity regime in the Douglas-fir types and tends toward a stand replacement regime in the spruce/fir types.

The fire regime for a majority of the diversity unit (59%) is classified as a mixed severity regime with an average fire frequency of 35 to 100 years. The spruce/fir habitat types (41%) are classified as a stand replacement regime with an average fire frequency of 200 plus years. Any given location within a mixed fire regime could experience some stand replacement fires and some non-lethal fires along with a number of fires that burn at mixed severities (Arno 1995). From a historical perspective, the 1988 fires in this area were not an unprecedented catastrophe but a normal feature of the area's very long-term disturbance regime (Romme and Despain 1989; Barrett 1994.)

The stand replacement fire regime consists of fires that kill most overstory trees and usually burn extensive areas uniformly, especially in wind-driven crown fires (Anderson 1968). However, a major portion of stand replacement regime is caused by lethal surface fire that consumes the ground fuels and kills the root collar of thin barked species such as spruce, fir, and lodgepole pine.

The majority of the project area is in a mature/over mature condition. Beetle killed trees and other natural fuel accumulations are creating a fuel bed that is quite volatile even with surface fires. Natural fuel loading ranges from five to 104 tons/acre with an average of 34 tons/acre.

Fuel loads between 15 and 20 tons per acre (dead and down) are the objective in order to minimize risks of fire, to have a reasonable expectation that direct control suppression efforts can be effective, to ensure the functioning of the brown rot cycle and nutrient cycling, and to provide a sufficient amount of dead and down material for wildlife purposes. As fuel loading increases beyond 20 tons/acre, fireline intensity increases beyond the capabilities of hand crews with direct attack when drought and extreme fuel and weather conditions exist.

Based on the current tree species, diameter and density, the predominantly Engelmann spruce stands have an average probability of mortality of 96% with weather conditions that occur at or less than 90% of the time during the summer fire season. The predominantly Douglas-fir stands have an average probability of mortality of 82% (FOFEM Model). In both stand types, the smaller diameter trees sustain complete mortality, and the larger diameter trees sustain less mortality.

In addition to heavy fuel loading the other factors that contribute to crown fire development is stand canopy bulk density and stand canopy base height.

Canopy bulk density refers to the characteristics of the tree canopy and is the mass of available canopy fuel per unit canopy volume of the tree stand. The denser and more compact the stand is, the higher the bulk density. The higher the bulk density the easier it is for the stand to initiate and sustain a crown fire. The current estimated canopy bulk density is 0.11 – 0.13 lbs/ft^3. Agee (1996) determined that 0.10kg m^3 is about the highest crown bulk density a stand can maintain and avoid the potential for crown fire behavior.

Canopy base height refers to the lowest height above ground at which there is sufficient canopy fuel to propagate fire vertically through the canopy. The current canopy base height in the spruce stands is four feet and in the Douglas-fir stands is 12 feet.

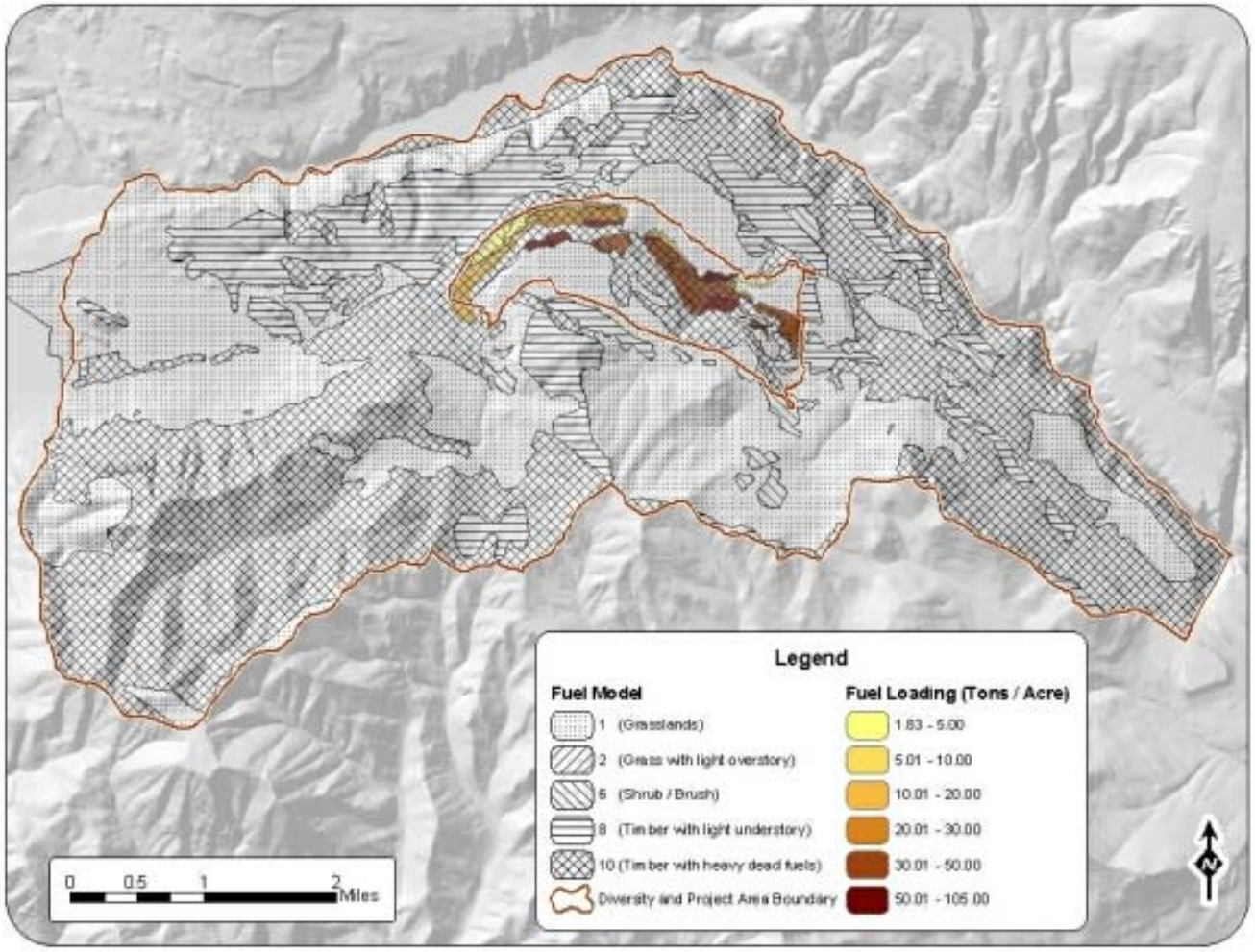
If a fire should start in the project area and not receive a successful initial attack response, based upon the current stand characteristics of fuel loading, crown bulk density, and canopy base height, a surface fire has the potential to burn 26 to 30 acres in a two-hour period with weather conditions on 90% of the days during the summer fire season. With 20-foot winds of 13 mph under the current fuel conditions, a crown fire can develop and has the potential to burn 176 to 359 acres in a two-hour period with rates of spread predicted at 0.5-0.7 mph (NEXUS Model).

Within the diversity unit, approximately 30% of the area has already burned in the past 15 years, with 43 fires occurring in the past 62 years. The probability for another large fire event within the next several decades is very high given existing vegetative structure, continuity of fuel sources (both vertical and horizontal), amount of fuel loading, and potential for severe fire behavior under drought conditions. The risk of loss from onsite fire starts is extremely high. Due to the project area's close proximity to the highway, and the adjacent private lands, power lines, etc., not only is the risk of human ignition higher than in adjacent forest lands, so is the threat to human health and safety.

Years	Probability of fire occurrence that exceeds 10 acres	Probability of a fire occurrence that exceeds 1,000 acres
1	9%	3%
10	63%	25%
20	86%	45%
50	99%	78%
100	100%	95%

Figure 8. *Fire occurrence probabilities for the diversity unit, based on past fire occurrence. These percentages are higher in comparison to adjacent areas that were not affected by the Clover Mist Fire. (PROBACRE Model)*

Figure 9. *Current fuel models and fuel loading in the Deadman Bench diversity unit.*



3.4.3 Forest Health Enhancement Opportunities

Insects

The proposed action, and other treatment alternatives, provides opportunities for reducing the risks and hazards associated with forest insects. In areas accessible by conventional logging equipment this can be accomplished primarily by providing a mosaic of types, age-classes, and patch sizes, the removal of older more susceptible host trees presently infested by insects, and by reduction of basal area.

Where control of Douglas-fir beetles on large areas is warranted and desired, sanitation harvesting removes currently infested and high risk trees from the site, and can be an effective means of reducing the rate of spread. And even though salvage harvesting does not reduce beetle populations, in stands that have already been heavily attacked and mortality has been high, salvaging dead trees for fuel reduction purposes, and to capture some economic value in the near future is an appropriate strategy in managed areas.

In high-risk areas where vegetation is being managed adjacent to infestation areas, silvicultural treatment to reduce the susceptibility of stands to the Douglas-fir beetle is also a very effective strategy. As unmanaged, overstocked stands containing a high percentage of large diameter Douglas-fir trees are highly susceptible to attack, reduction of basal area below 80% of normal stocking effectively reduces their susceptibility to beetle attack. This would generally require a much higher degree of tree removal (more smaller diameter trees) than that associated with a sanitation cut. This requires treatment before epidemic levels of infestation if larger trees are to be saved.

The areas having the highest levels of beetle infestation and tree mortality within the project area are those pure, over mature Douglas-fir stands immediately below the reef. Although they have high mortality, and there are tremendous amounts of volume that could be salvaged using silvicultural treatment, there is no reasonable route to access a portion of these stands using conventional tractor logging methods. Aerial or low ground pressure methods could be used on a portion of these areas if that capability were available**.** However, maintenance of the existing vegetation in many of these areas is necessary to meet other resource objectives, primarily wildlife.

Fuel Loading

Opportunities exist for changing from the existing condition toward a more desirable condition relative to fire behavior and effects. Any of the treatment alternatives would decrease fuel loading and fuel continuity by thinning. Opportunities also exist for enhancing fire suppression capability by improving access that shortens response times. Commercial harvest and treatment opportunities appear to be the only reasonable option for dealing with this high density of aerial fuels as well as the high level of fuel loading.

3.4.4 Effects on Forest Health

Effects of Alternative I on General Forest Health

With Alternative I, mature stands would continue to progress toward a late successional state while sustaining additional mortality and growth losses due to insect problems. Grass and forb production would be reduced in the long-term because timber densities (including regeneration) would increase and shade out most forage and browse species. Coniferous timber stands would also continue their expansion into meadows, riparian areas, and wetlands, further reducing overall vegetation and

habitat diversity. In the short-term, new openings and regeneration would be created only by loss of canopy trees due to insect infestation or other natural disturbance.

As more trees die and fuel loading increases, so would the risk and severity of potential wildfires. In the absence of fire or other succession-reverting disturbance, the following trends can be expected (Barrett et al. 1991)

- The amount and distribution of aspen would be reduced
- Meadows/openings diminish in size or disappear
- Overstory trees would be older than the historical average
- Diversity and patchiness would be reduced
- Vulnerability to insect epidemics would increase (until the epidemic has run its course)
- Vulnerability to stand replacing fires would increase

With Alternative I, natural thinning would continue to occur in conjunction with the Douglas-fir beetle outbreak, and there would be further reductions in overstory basal area of live trees and reductions in average tree diameters of live trees across the landscape. Based on the levels of mortality that have occurred to date, managers can expect to lose between 40 and 70 percent of the Douglas-fir basal area in areas of heavy insect infestations, with tree mortality affecting diameter classes ranging from 12 to 34 inches in the long-term.

In addition, the majority of trees over 16 inches in diameter at breast height would be lost. In the short-term, regeneration (composed primarily of Douglas-fir) and forage production can be expected to increase as much as three- to four-fold in beetle-caused openings. The Douglas-fir beetle population would continue to spread and infest additional sites, most likely at reduced levels.

Although it may be several years (10+) before the majority of standing dead trees fall and accumulate on the ground, with Alternative I the fuels build-up on the forest floor is predictable. In many areas, the existing fuel load is already excessive. The additional projected fuel loads of heavy fuels resulting from expected mortality would be in excess of 30 tons/acre. Forest insect infestation is expected to continue causing high mortality and continued accumulation of additional dead and down in the future.

With Alternative I, it can be expected that there would be increasing numbers of dying and dead trees and an increase in both ladder and heavy ground fuels. This fuels build-up would contribute generally to forest conditions that are highly susceptible to wildfire. Because of this high accumulation of dead and down materials, fuel loads and risk of fire are presently high, and anticipated to become excessive with regard to Forest Plan objectives. Such hazards would exist until natural disturbance factors such as wildfire set back forest succession.

Based on the stand structure, the amount of ladder fuels, and the amount of heavy fuels (both aerial and ground), it is highly probable that the long-term effects of Alternative I would be a high intensity stand replacement fire if the fire starts within the project area, with the outcome being very similar to the burned areas adjacent to and above the project area. In a high intensity stand replacement fire there would be varying degrees of fuel consumption and fire effects. All or a high percentage of the organic duff layer would be consumed, a high percentage of twigs, sticks and logs less than six inches in diameter would be consumed, logs greater than six inches would be scorched and partially consumed, and live tree crowns would be scorched with a high mortality rate. Such a fire usually occurs with high fuel loading when influenced by steep slopes and/or wind. .

Such stand-replacing fires have the potential for direct effects to airsheds, watersheds, aesthetics, visitor experience, wildlife habitat, public health and safety, human possessions, and economic

stability. The indirect effects include possible increases in surface and mass erosion, nutrient loading, sedimentation, and displacement of many forest related wildlife species.

Effects of Alternatives II, III, and IV on General Forest Health

Alternatives II, III, and IV would have a beneficial effect on forest health, but to differing degrees. Alternative II would have the most beneficial effects on forest health relative to affecting the largest number of forest types (aspen, meadow, wetland, riparian, conifers, etc.). Alternative III would be beneficial relative to reducing the hazards due to insects and wildfire in the coniferous forest, but would have little effect on the health of other vegetative types. Alternative IV would have the greatest beneficial effects on forest health of the coniferous forest type relative to insect infestation and wildfire, as it reduces the basal area the greatest amount.

Effects of Alternatives II and III Relative to Insects

Sanitation/salvage harvest, as proposed in Alternative II and Alternative III, when applied to the two-aged class stands (most stands) in the beetle-infested areas of Douglas-fir, would be comparable to a shelterwood regeneration cut. This is because of the existing overstory (older age class) stand composition, the percentage reductions in overstory basal area, and the preferential selection of large diameter trees by the Douglas-fir beetle.

Sanitation of existing stands and salvage treatment would provide a high degree of protection to adjacent stands at risk that are not presently affected by removing potential high-risk host trees. Stand sanitation and salvage treatments would reduce the hazards from insects within treated stands and those stands immediately adjacent, by removing overstory trees that are infested with Douglas-fir beetles and those that are highly susceptible to attack (mature/over mature, decadent, trees over 16 inches diameter at breast height).

Effects of Alternative IV Relative to Insects

Silvicultural treatment as proposed in Alternative IV would reduce the basal area below 80% of normal (live trees). This treatment would reduce susceptibility of Douglas-fir stands to Douglas-fir beetle attack, and would limit tree mortality and infestation size in the event of future increases in beetle populations. The level of risk from insect infestation is proportional to the amount of mature stems and the live basal area. Therefore, Alternative IV removes the most mature trees and provides the highest degree of protection from infestation.

Growth rates of understory trees within stands harvested would be expected to increase with removal of competing high-risk overstory trees. Adequate regeneration would not be a major concern in most areas, as abundance of regeneration in heavily beetle-infested areas in adjacent areas is three times the amount found in non-infested areas.

With all treatment alternatives, within the treated stands merchantable trees obviously infested with insects and high-risk trees would be removed, enhancing the health of that immediate area.

Effects of Alternatives II, III, and IV Relative to Fuel Loading

With implementation of Alternatives II, III, and IV, heavy fuels (sound dead trees both standing and down) would be salvage harvested, and areas with high levels of heavy ground fuels would be YUM in order to minimize fuel loading and minimize risk to wildfire. With whole tree yarding the majority of the fine fuels (limbs less than three inches in diameter, and needles) would be removed from the units and piled and burned at landings. Some of the fine fuels would fall off the tree during felling or yarding and remain in the unit but would not be of substantial amounts to impact long-term fuel loading. Fuel reduction not only slows the spread of fire by reducing fuel accumulations, but also breaks fuel continuity. This also aids fire suppression efforts by allowing direct attack by hand crews because of the lower fire intensity and flame lengths.

As the susceptibility and risk of fire is directly proportional to the availability and type of fuels, the highest degree of protection from fire is provided by any action that reduces overall fuels (amount and continuity) to the highest degree. Although excessive activity fuels increases fire risk in the short-term, any timber treatment that thins the stand to the greatest degree and reduces the activity fuels the greatest amount provides the greatest degree of protection from risk of fire in the long-term. All treatment alternatives reduce the risk of fire to some degree, but Alternative IV reduces the risk of fire due to fuel continuity and high fuel loading the greatest degree.

The other primary factor relative to fire suppression capability (relative to this proposal) is response time. Where roads exist for engine access, the suppression capability is maximized; where roads do not exist and firefighters must hike into a fire or depend on aerial resources, suppression capability is minimized. Fire suppression capability based on the presence of roaded access in the project area for fire suppression purposes is as follows:

- Alternative I – existing roads allow access to the area, but are narrow, steep in places, and have inadequate clearance for non-4x4 vehicles - minimal vehicle related suppression capability
- Alternative II – roads would be reconstructed allowing wider non-4x4 vehicles (engines) access for optimal vehicle related suppression capability
- Alternative III – roads would be reconstructed allowing wider non-4x4 vehicles (engines) access for optimal vehicle related suppression capability
- Alternative IV – roads would be reconstructed allowing wider non-4x4 vehicles (engines) access for optimal vehicle related suppression capability

Implementation of an initial attack strategy that emphasizes aerial attack by smokejumpers, helitack, and retardant as the first response can enhance suppression capability with any alternative, but is dependent on resource availability during a fire event and weather conditions.

3.5 Wildlife

The key criteria used to distinguish wildlife habitat value relative to vegetative diversity are the variety of vegetative type(s), biological and geometric structure of individual stands/patches, distribution of stands/patches, and what each stand's function is relative to wildlife's essential needs relative to the cruising radius of dependent species. Additional factors that determine habitat value are vegetative pattern, positioning of patches, and corridor linkages between patches.

The habitat analysis portion of this evaluation process is generally referred to as habitat value or habitat capability analysis. In order for any wildlife species to persist in a given area, the habitat must provide for species' essential needs. Habitat value relates to capability of the land to provide essential biological needs of the species, such as forage and security cover. Habitat value is a measure of the degree that an area of land can provide for the needs of a species.

Of equal importance to obtaining the most desirable vegetative conditions for diversity, wildlife habitat value, etc., management simultaneously must evaluate and regulate human activity, development, and disturbance such that wildlife habitat can be inhabited and used by wildlife to its maximum potential. This portion of an analysis and evaluation process relates to what is generally termed habitat effectiveness, which assesses the human disturbance factors on wildlife (i.e., roads, recreation activities, etc.).

Habitat effectiveness relates to the degree that an area of habitat is actually being used by wildlife when considering non-habitat factors such as human disturbance. It relates to the tolerance, adaptability, or acclimation of wildlife species to human disturbance activities and the resulting levels of use or displacement from the area. It is usually measured or referenced relative to the level

or amount (%) of effectiveness when considering the distance of the comfort or security zone of a species when compared to a given unit of area. The evaluation of habitat effectiveness compares existing conditions to future conditions under different alternatives relative to human disturbance factors, and attempts to determine the effects of those activities on the degree that the habitat will actually be used. It is possible to have excellent habitat value and have little or no wildlife use (minimal habitat effectiveness) due to human disturbance; in other words, wildlife have been displaced from the area due to non-habitat factors such as motorized intrusions or harassment.

Wildlife Analysis Process

To adequately assess effects to wildlife, the minimum size of the analysis area must be at least the size of the average home range of the species of concern. This wildlife analysis was completed considering both a coarse scale landscape view, and a fine scale proposed project area perspective. This focus of this analysis was the 1,217-acre Deadman Bench proposed project area, which is the area being evaluated for possible treatment. However from a diversity and wildlife perspective, a landscape diversity unit, composed of 15,767 acres, set the outer bounds for analysis for all species except the grizzly bear. Analysis at the grizzly bear management unit subunit level was also completed for the bear (Crandall subunit of 200,000 plus acres).

The US Fish and Wildlife Service has identified two endangered species, three threatened species, one proposed species, and one experimental population that is to be managed the same as a proposed species, which may possibly occur on the Shoshone. No proposed or critical habitat for any of these species has been designated within the diversity unit; however, the area is within habitat designated as essential for recovery of several species. The Endangered Species Act requires evaluation of potential effects of actions on listed and proposed species and designated and proposed critical habitat, and a determination as to the effects of the action. *An evaluation for proposed and listed species was completed and a letter of concurrence from the USFWS is in the project file.*

Region 2 of the Forest Service has designated some species of wildlife as sensitive, thus requiring an in-depth look during project design and analysis. There are 38 species listed on the Region 2 sensitive species list that may possibly occur on the Shoshone. Forest Service Manual direction requires a review of all actions and the potential effects of the actions on wildlife species designated by Region 2 as sensitive on the Shoshone. *The biological evaluation for sensitive species is integrated into this document, and the biologist signature page is in the project file.*

Seventeen wildlife species, in addition to game trout, were selected during the forest planning process to be management indicators. The management indicators species (MIS) for the Shoshone include five featured species that are hunted, five recovery species, and seven ecological indicator species. Methods used to select indicator species or groups of species are explained in detail in the planning records for the Forest's Land and Resource Management Plan. *Management Indicator Species habitat relationships used at the time the Forest Plan was written were revalidated in 2002; the final report (dated November 27, 2002) is available at the Forest Supervisor's Office.* Those MIS (or their habitats) that are within the project area, or may be affected by this proposal, were evaluated relative to the effects of this action and will be addressed in this document.

Habitat requirements for all proposed, listed, sensitive, and MIS were a major consideration in the formulation and project design of this proposal. The scope of this wildlife analysis was limited to those listed, sensitive, and Management Indicator Species, or their habitats that may be potentially affected by this action. The analysis is based on estimating the effects of changes in vegetation type, timber age classes, community composition, and yearlong suitability of habitat related to the mobility of potentially affected species. Analysis of effects and a determination of the effects of the action on each species (or group of species when habitat requirements are similar) are included. This analysis focused on identified issues in the context of this direction.

A preliminary analysis of all proposed, listed, Region 2 sensitive, and Forest Plan MIS and their habitat requirements was completed for this proposal, and documented in the Wildlife and Botanical Report, which is contained in the project file. This preliminary analysis determined which wildlife and plant species or their habitats were likely to be present within the proposed project area, and which species or groups of species should be carried further in the analysis process. All species were reviewed, and all were considered for evaluation relative to this project; however, those species outside of any effects of the proposal physically, temporally, geographically, or biologically were eliminated from further evaluation.

The following discussion of effects addresses only those wildlife species that could be potentially affected by the proposed action and alternatives to it. In addition, effects on those species (or their habitats) identified as being of major concern that were identified during scoping will be addressed. Those species that were eliminated from detailed analysis, and the rationale for eliminating them are shown in the following table.

Wyoming Partners in Flight group rated species in priority order of conservation needs. The highest priority level includes four birds that occur on the Shoshone: Brewer's sparrow, northern goshawk, peregrine falcon, and bald eagle. All of these species are included in other categories discussed in this document.

Species	Status	Reason for elimination from further evaluation
Black-footed ferret *(Mustela nigripes)*	Endangered MIS	No suitable habitat within project area – associated with grassland and prairie types and specifically prairie dog towns – no prairie dog towns are known to exist on the Forest in this area
Mountain plover *(Charadrius montanus)*	Proposed	No suitable habitat exists within the project area – species avoids mountainous areas and prefers short-grass prairie types
Whooping crane *(Grus americana)*	Endangered	No suitable habitat within the project area – requires wetland and marsh types – wetland in project area is coniferous type wetland and not suitable habitat – there is no documented occurrence of whooping cranes on the Forest
Peregrine falcon *(Falco peregrinus)*	Sensitive MIS	Marginal habitat and no evidence of peregrine based on field survey - cliffs in project area are marginal habitat for nesting as they are quite small and not directly affected by the proposal
Merlin *(Falco columbarius)*	Sensitive	Marginal habitat in project area – prefers plains or boreal types
Ferruginous hawk *(Buteo regalis)*	Sensitive	No suitable habitat in project area - is a migrant only and is associated with western plains, arid regions, and lowland bottoms
Osprey *(Pandion haliaetus)*	Sensitive	No suitable habitat in project area – requires large bodies of water containing adequate supplies of fish
Fringed myotis *(Plecotus thsanodes)*	Sensitive	Habitat (caves) not affected by proposal – documented only in eastern Wyoming
Townsend's big-eared bat *(Plecotus townsendii)*	Sensitive	Habitat (caves) not affected by proposal –habitat is marginal as the most typical western habitats for this bat are desert shrub lands, pinyon-juniper woodlands or dry coniferous forests
Spotted bat *(Euderma maculatum)*	Sensitive	Habitat (caves) not affected by proposal – limited documentation in Wyoming – not documented on Forest
Allen's thirteen-lined ground squirrel *(Spermophilius tridecemlineatus alleni)*	Sensitive	No suitable habitat in project area Requires large grasslands Most likely extirpated in State No records on Forest
Common loon *(Gavia immer)*	Sensitive	No suitable habitat (lakes) in project area – loons are known to use the Swamp Lake area which is in the diversity unit

Species	Status	Reason for elimination from further evaluation
Trumpeter swan *(Cygnus buccinator)*	Sensitive	No suitable habitat (lakes & large rivers) in project area – trumpeters are known to use the Swamp Lake area which is in the diversity unit but well outside the project area
Harlequin duck *(Histrionicus histrionicus)*	Sensitive	There is no suitable habitat within the project area – the Clarks Fork River is the only potential suitable habitat within the diversity unit as the species requires large streams or rivers
Long-billed curlew *(Numenius americanus)*	Sensitive	No suitable habitat in project area – requires prairie and grassy meadows
Upland sandpiper *(Bartramia loicauda)*	Sensitive	No suitable habitat in project area – require open grassy areas and grassy bogs
Black tern *(Childonias niger)*	Sensitive	No suitable habitat in project area – requires wetland types of plains and prairies
Sandhill crane *(Grus canadensis)*	Sensitive	No suitable habitat in project area – requires wetlands – are known to use the Swamp Lake area but the wetland in the project area is not suitable in its present successional state
Burrowing owl *(Athene cunicularia)*	Sensitive	No suitable habitat in project area – requires open grasslands and associated with burrowing animals (prairie dogs)
Loggerhead shrike *(Lanius ludovicianus)*	Sensitive	No suitable habitat in project area – inhabits open plains country
Yellowbilled cuckoo *(Coccyzua americanus)*	Sensitive	No suitable habitat in project area – requires low dense shrubs - found in lower elevations than project area
Lewis' woodpecker *(Melenerpes lewis)*	Sensitive	No suitable habitat in project area – requires open country with scattered park-like ponderosa & cottonwood
Baird's sparrow *(Ammodramus airdii)*	Sensitive	No suitable habitat in project area – requires large areas of prairie grasslands
Fox sparrow *(Passerella iliaca)*	Sensitive	Marginal habitat in project area – requires dense shrubby undergrowth – very common species in western U.S.
Pygmy nuthatch *(Sitta pygmada)*	Sensitive	No suitable habitat in project area - – prefers open park like ponderosa pine forests
Bighorn sheep *(Ovis Canadensis)*	MIS	Outside range of normal occurrence, incidental use may occur
Mountain goat *(Oreamnos Americana)*	MIS	No suitable habitat within project area - outside range of normal occurrence - incidental use may occur
Beaver *(Castor canadensis)*	MIS	Marginal habitat as only intermittent steams exist in project area

Figure 10. *Species on which this proposal would have no effect, their status, and the reason they were eliminated from further evaluation.*

3.5.1 Management Direction Relative to Wildlife and Their Habitats

The following are Forest Plan standards pertaining to wildlife that are applicable to this project. There are additional standards that also apply to wildlife habitat (old growth, snags, dead and down, and aspen), but as they also relate to diversity in general, they are included in the diversity portion of the Forest Plan and in the diversity portion of this analysis.

- Habitat for each species will be maintained to at least 40% of potential (III-49) (It is assumed that this relates to both habitat value and habitat effectiveness)

- Improve habitats where vegetative conditions are significantly below biological potential (III-8)
- Improve habitat capability through direct treatments of vegetation, soils, and water (III-52)
- Provide for wildlife habitat improvement and enhancement of other renewable resources in Sale Area Improvement Plans (III-59)
- On big-game winter ranges, maintain habitat capability to at least 80% of potential capability (III-167)
- On big-game winter ranges, maintain habitat effectiveness of at least 90% during the winter period (III-167)
- Hiding cover will be maintained on at least 60% of the perimeter of natural and created openings (III-50)
- Hiding cover will be maintained along at least 75% of the edge of roads (III-50)
- Hiding cover will be maintained along at least 60% of streams and rivers (III-50)
- Hiding cover will be maintained on at least 40% of the forested type within a diversity unit (well distributed throughout the unit) (III-51)
- Thermal cover will be maintained on at least 20% of the forested type within a diversity unit (III-51)
- Edge contrast of at least medium will be maintained between even-age stands (III-52)
- Protect nesting raptors by disallowing management activities within 300 feet of any occupied raptor nest from May 1 to July 31 (III-53) (This will be included as a permit/operating plan requirement)

The 2nd edition of the Canada Lynx Conservation Assessment and Strategy also contains standards specific to potential lynx habitat (pages 7-4 to 7-6). To summarize the standards:

- 70% of identified potential lynx habitat in a LAU must be maintained in suitable condition
- 10% of identified potential lynx habitat in a LAU must be maintained as denning habitat in five-acre patches
- No more than 15% of identified potential lynx habitat in an LAU can be converted to unsuitable habitat within a 10-year period
- Salvage harvest following disturbance is limited to areas of more than five acres
- Maintain habitat connectivity across the landscape
- Maintain dense horizontal cover of conifers, just above the snow level in the winter
- Apply harvest prescriptions that favor regeneration of old-age aspen
- Maintain suitable acres and juxtaposition of habitat patches that provide for the essential needs of the lynx
- Prescribe silvicultural treatments that develop vegetation characteristics suitable for snowshoe hares - recruit high density of conifers, hardwoods, and shrubs
- Maintain/enhance habitat conditions for important prey species
- Restrict or reclaim (decommission) roads where densities exceed two miles per square mile

- Limit use of timber sale roads

Grizzly bear guidelines and management direction in the Forest Plan were also used as a part of alternative design.

- Sale activities would be limited to no more than three consecutive years, and the normal operating season is from July 1 to February 28. Also, entries are limited to one per sale area per decade (III-65)
- A security area in excess of 5,000 acres adjacent to the project will be maintained (III-66)
- The timber sale contract would include a clause providing for temporary cessation of activities, if needed, to resolve potential or existing grizzly/human conflict(s) (Grizzly Bear Management Guidelines 7-12)
- Food and garbage storage regulations for Grizzly Bear Use Areas would be followed in any temporary logging camps to reduce the likelihood of attracting bears (III-66)

3.5.2 Existing Condition of Habitat Value

Based upon observations and sign, this project area is extremely important habitat for many varied species of wildlife. The 1994 ASQ ROD stated that the extensive size of the 1988 burn has complicated providing a mix of habitat situations in some areas, and has elevated the value of remaining forest cover for wildlife. This diversity unit area is a wildlife area of concern as designated in the 1994 Allowable Sale Quantity FEIS (pages IV-28 to 31), and this project area is one of those remaining forested areas.

Areas of concern are those areas that can be affected by the cumulative sources of change. Changes in vegetation can cause changes in wildlife habitat that may destabilize wildlife populations or irretrievably disturb use patterns. Higher levels of use by humans also may disrupt or displace wildlife. In this area of concern roads and their associated activities; in conjunction with past harvest activities and the 1988 burn, are the primary attributes contributing to this condition.

Existing habitat values for the project area are quite high for those species requiring late succession coniferous forest. However, some specific aspects of habitat value (specifically deciduous vegetation types) are significantly below their biological potential. Of major importance relative to many wildlife species is the accelerated decline of overhead canopy coverage due to high levels of mortality from insects. This has reduced the canopy in some heavy infestation areas from 80+% to less than 10%.

3.5.3 Habitat Value Enhancement Opportunities

As the proposed project area is well below its optimum potential relative to diversity and habitat value for species richness, opportunities exist to enhance habitat values for species richness and for selected indicator species. There are opportunities within the project area to enhance habitat values for species that use wetlands, interior meadows, and riparian areas as well as aspen and other deciduous vegetation. Due to the mature status of conifers on the majority of the proposed project area, opportunities also exist for enhancing a distribution of seral stages that results in a mosaic pattern of types and seral stages.

3.5.4 Effects on Habitat Value

Alternative I

Alternative I would not initiate management action to cause change in habitat value by manipulation of vegetative succession. However, changes in natural succession would enhance

habitat value for species related to mature coniferous forest in the short-term because old growth components of dead and down would increase. In the long-term, habitat value for early succession coniferous forest species and species related to dead and down would be enhanced. This is due to the mortality of the overstory trees due to insects.

Alternative II

Alternative II would enhance habitat value for a variety of species. This is because this alternative favors a mix of vegetative types and seral stages. Habitat value for species related to riparian, aspen, and wetland types would be enhanced (58 acres total). Setting succession back to mid-seral in the wetland would enhance diversity of type and composition and provide preferred wildlife habitat characteristics for many species. This action would enhance to a high degree the amount of aspen, willow, alder, and birch that enhance functioning relative to filtering and erosion resistance, and connectivity, as well as providing high quality wildlife habitat. Habitat value for species related to dead and down components of coniferous forest would decrease, as many of the decadent, dead, and down trees would be removed using harvest actions.

Alternative III

Alternative III would enhance habitat value for a variety of species, as it causes a reversion to earlier seral stages in some areas. However, it does nothing to enhance habitat value of deciduous vegetative types such as aspen, riparian, and wetland that are well below potential. Habitat value for species related to dead and down components of coniferous forest would decrease with this alternative. This is because many of the decadent, dead, and down trees would be removed using harvest actions.

Alternative IV

Alternative IV would enhance habitat value for species associated with early coniferous forest succession. This is because it sets back succession of coniferous types to early/mid seral stage. Habitat value for species related to mature forest, and dead and down components of coniferous forest would decrease with this alternative. This is because the majority of mature, decadent, dead, and down trees would be removed by harvest actions. This action would have the greatest impact to these species as it removes the most amount of mature timber.

3.5.5 Existing Condition of Hiding and Thermal Cover

Vegetative hiding cover is defined as vegetation capable of hiding 90% of a standing elk from the view of a human at a distance equal to or less than 200 feet. The animal is essentially hidden at this distance (Thomas 1979). Hiding cover is also referred to as escape cover or security cover.

Vegetative hiding cover is presently available on over half of the forested land within the 15,767-acre diversity unit as well as within the proposed project area. High quality cover also exists along timbered areas of Deadman Bench Road, along the small stream, and around the natural openings. Much of the timbered area adjacent to the large meadow on Deadman Bench contains a highly decadent overstory, however the majority of this edge contains advanced regeneration and a young vigorous overstory component as well. Hiding cover within the old clear cut, and within bug-killed stands which were infested immediately after the fire and have regenerated, is highly effective also.

There is presently sufficient hiding cover to hold elk and other big game species in the area during major disturbances. Due to the loss of overhead canopy in the Douglas-fir type having recent mortality from insect infestation, hiding cover quality in many stands is rapidly declining. This decline will continue until regeneration reaches sufficient height to provide hiding cover (10 to 20 years).

It is important to note that hiding cover as used in this analysis is a concept generally related to motorized road densities, the associated human uses, and is ultimately related to habitat effectiveness. As road densities and human uses decrease, hiding cover becomes less of a concern.

Warm-blooded animals must maintain a nearly constant body temperature. Thermal cover is vegetative cover that is used to assist in maintaining a constant body temperature. Thermal cover is defined as a stand of coniferous trees more than 30 acres in size, more than 40 feet tall, and having an average canopy closure exceeding 70%. It is important to note that thermal cover is an important component used in thermal regulation for both heating and cooling. Of the forested land within the diversity unit 20.5 % presently provides thermal cover. Within the project area thermal cover is declining at an accelerated rate in the mature Douglas-fir stands due to the loss of the overhead canopy because of insect mortality. Some of the spruce stands are also losing the overstory trees due to old age mortality.

3.5.6 Effects on Hiding and Thermal Cover

When analyzing the effects of different alternatives on hiding and thermal cover, it must be noted that when considering the changes on these components in the context of the diversity unit standards, the acreage changed due to management manipulation is inconsequential. Also, one must keep in mind that the changes in stand structural and canopy levels resulting from epidemic levels of insect infestation have and will continue to accelerate the loss of both hiding and thermal cover in the short-term.

One of the major management concerns relative to this analysis was the maintenance of sufficient cover within the project area over the next several decades. It is quite possible that with any of the alternatives cover would be below minimum standards for more than a decade. Forest Plan standards do allow such deviation in order to allow for management of long-term health problems (III-51). As the amount and quality of cover also influences habitat effectiveness relative to motorized access and human disturbance, access management was a major consideration that was factored into the possible solutions when analyzing the trends for both hiding and thermal cover.

Alternative I

Alternative I would maintain existing levels of hiding cover and thermal cover in the short-term. However, due to insect mortality, canopy coverage would be reduced to a level similar to Alternatives II and III, resulting in a decrease in both hiding cover and thermal cover in the short-term. Hiding cover would be enhanced due to an increase in regeneration within 15 to 20 years. Thermal cover would require many decades (40 to 50 years) to achieve pre-insect infestation thermal cover characteristics.

Alternatives II, III, and IV

Alternatives II, III, and IV would not treat approximately 47% of the timbered area within the project area, thus maintaining existing hiding cover and thermal cover values, even though those values are declining. Therefore, vegetative hiding cover and thermal cover would be similar for all action alternatives in areas outside of the actual treatment units.

Within the individual treatment units, hiding cover and thermal cover would be highly variable dependent on existing condition and proposed silviculture. In general, sanitation/salvage harvest (Alternatives II and III) would maintain more hiding cover and thermal cover than a treatment to reduce basal area (Alternative IV) in the short-term. When viewed from the top of the reef, Alternative IV would have the greatest impact to hiding cover, as it would reduce overhead canopy closure the greatest amount in the short-term. In 15 to 20 years, all areas treated in all action alternatives would provide hiding cover because of the enhanced regeneration. In addition, all treated areas would again provide thermal cover within 40 to 50 years.

3.5.7 Existing Condition of Habitat Connectivity Between Patches

Although the Forest Plan does not specifically provide guidelines for wildlife travel linkage corridors, the hiding cover requirements adequately provide maintenance of travel corridors. There is adequate linkage of cover patches throughout the project area to accommodate secure movement of all ground dwelling species. It is the intent of this proposal to maintain adequate travel corridors for all species of wildlife, during all seasons of the year within the project area.

3.5.8 Effects on Habitat Connectivity Between Patches

The linkage corridors to be deferred from treatment are the same for all alternatives. Sufficient linkage would be provided in all alternatives to allow movement and access adequate to meet the biological needs of all species in the project area. *See* treatment area map (Figure 4) and note the continuous corridors provided by the untreated areas.

Alternative I

Alternative I provides much more linkage than the action alternatives in the short-term because more canopy cover exists. In the long-term, linkage corridors would be maintained due to the regeneration resulting from the loss of the overhead canopy. Many existing linkage corridors for large ungulates would become restricted due to the excessive amount of large dead trees falling down because of insect mortality.

Alternatives II, III, and IV

Alternatives II, III, and IV also provide linkage corridors throughout the project area. Vegetative connectivity was a major criterion for design, and linkage corridors were maintained along the length of the project area for all action alternatives. Therefore, the effects of treatment on linkage corridors are similar for all action alternatives. Once regeneration of treated areas has occurred (15 to 20 years), the majority of those treated areas would also provide secure linkage corridors for movement.

3.5.9 Existing Habitat Effectiveness in General

Open road densities average between two and three miles of road per square mile, which results in a habitat effectiveness rating well below the 40% that is the required minimum.

Studies have shown that habitat effectiveness is dependent on several factors such as wildlife species, cover type, hiding cover quality, topography, amount and duration of vehicle use, associated human use, presence or absence of adjacent security areas, and historical activity that may have allowed potential acclimation. The one point that is significant in all studies is the fact that when open roads exceed approximately one mile per square mile, habitat effectiveness decreases at a much-accelerated rate with each additional unit of roads, and the amount of secure habitat becomes a major concern.

Existing habitat effectiveness values within the project area range from low to high depending on the season of use. From Memorial Day weekend through hunting season in the fall, habitat effectiveness is low as there is human activity associated primarily with roaded recreation activities throughout the project area, especially adjacent to the open roads. During the winter and spring seasons, habitat effectiveness is presently higher as little human activity occurs due to lower use on the highway, the inaccessibility of the Deadman Bench Road due to icing and mud, and the inaccessibility of the Camp Creek Road due to seasonal closure until July 15.

Habitat effectiveness within the diversity unit overall is moderate to high depending on the season. So long as the seasonal road closure is maintained on the Camp Creek Road until mid-July, habitat

effectiveness on most portions of the overall diversity unit will remain at acceptable levels during the critical winter and spring periods.

3.5.10 Habitat Effectiveness Enhancement Opportunities

Due to the area's seasonal low habitat effectiveness (due primarily to existing open road density), opportunities exist for providing a much higher level of habitat effectiveness based on road management restrictions. Closing the middle of the three open roads that parallel this area (the Deadman Bench Road), habitat effectiveness could be increased to the 40 to 50% range, and by maintaining the seasonal closure on the Camp Creek Road until mid-July increases this to 75% or more during the critical spring young-rearing period. Capitalizing upon opportunities for decommissioning roads and implementing restrictions would meet the intent of required standards for big game hiding cover, grizzly bear, and lynx.

3.5.11 Effects on Habitat Effectiveness in General

Habitat effectiveness relative to grizzly bear and big game will be discussed in sections specific to those species. One factor that determines the magnitude of adverse effects on habitat effectiveness is vehicular use. The degree of road restrictions determines the degree of adverse effects, and each alternative has differing levels of restriction. There would be no direct effects from logging activity on habitat effectiveness during the critical spring period with any alternative because no logging activity would be allowed during the critical spring use period of April 1 to July 14.

Alternative I

Alternative I would most likely result in a slight decrease in habitat effectiveness in the short-term because of reduced canopy coverage (thus reduced hiding or security cover) due to natural thinning of the overstory by insects. Grizzly bear and large ungulates would be most impacted by human disturbance associated with the open roads.

Alternative II

Alternative II would cause a decrease in human activity associated with motorized use, and an associated increase in habitat effectiveness for the project area. This increased habitat effectiveness would be due to road restrictions and road decommissioning above the present level.

Alternative III

Alternative III would result in a decrease in habitat effectiveness in the project area in both the short-term and long-term during the seasonal period when the road is open (July 15-December 15). This is because the new access road would remain open during this period, allowing motorized use to occur within the timbered area, whereas it occurs only in the meadow areas at this time. This would be occurring at the same time that hiding cover within the timbered areas would be decreased. Habitat effectiveness would be increased during the winter and spring period due to the access restriction.

Alternative IV

Alternative IV would result in a dramatic increase in habitat effectiveness in both the project area and the diversity unit due to the yearlong restriction on motorized use in the Camp Creek, Reef Creek, and Deadman Bench areas. This would provide a more secure area even though there would be minimal areas of timber cover in the burn area, and a decrease of cover in the project area in the short-term.

3.5.12 Management Indicator Species

Yellowstone cutthroat trout is the Forest's aquatic Management Indicator Species. *See* section 3.6.3 Watershed Effects for the discussion on Yellowstone cutthroat trout.

Existing Conditions for Elk and Mule Deer

Elk (*Cervus elaphus*) is a Forest Management Indicator Species (MIS) that was identified during scoping as being of concern relative to this proposal. Elk are related to early succession forest and grassland types. Mule deer (*Odocoileus hemionus*) is also a MIS with healthy viable populations on the Forest, and as their habitats in forested areas are very similar to elk, it will be assumed that analysis of effects for elk will be applicable to mule deer. Therefore mule deer will be discussed no further.

Healthy, viable populations of elk exist on the Forest, with populations being at or above objectives in most areas. Overall, population trends have been upward since the 1980s, and hunter management the past several years has been oriented to bringing the populations down to objectives. Hunting, combined with other cumulative factors of predation by large predators and drought conditions, is presently bringing the populations down.

Several hundred elk traditionally use the project area during movement between summer range in the Crandall Creek drainage and wintering grounds associated with the lower breaks and benches of Clarks Fork Canyon. Elk are a common sight during spring and fall, and a few bulls generally winter in the area. Numerous cow elk were observed in the project area during late May and June during the past several years, which is indicative of its importance as a birthing area, at least during years when higher elevation areas are still snowbound. Game trails are well established, with tracks and pellets groups being very abundant on most portions.

The 1988 fires affected elk habitat and elk movement in this area. The effect was to render this forested corridor of critical importance on the scale of the entire diversity unit and adjoining summer and winter ranges for elk. Combined effects of past fires, past harvest, continued public motorized access, and loss of canopy cover due to insects have the potential to negatively impact elk use and movement in the proposed project area during the birthing and hunting periods. This is because of disturbance related to motorized access in conjunction with a reduction in hiding cover during the short-term.

Because of the fires in 1988, elk habitat value has been increased in general throughout the Forest due to the tremendous increase in forage availability. There is little doubt that the increase in elk numbers during the 1990s was in a large part attributable to this increase in forage availability. However, in some localized areas, including the area immediately above the proposed project area, the fire reduced the availability and distribution of forested cover and eliminated cover used as travel linkage corridors.

The Clover Mist Fire of 1988 burned extensive areas of timber adjacent to the proposed project area, and has resulted in reduced tree cover in many areas. Although some timbered areas used as cover and travel corridors were burned, the geologic terrain in many of these areas still provides some sense of security for wildlife movement so long as there is no disturbance by vehicle intrusions and human activity. Since the 1988 Clover Mist fire, which burned much of the area immediately above the project area, elk have used the mature forested corridor within the project area more so than prior to the fire, especially as travel linkage corridors and as escape (hiding) cover during the hunting season.

Presently, travel corridors are well established throughout the project area, and there is little blockage from dead and down material in most areas. This condition is changing very rapidly as bug-killed trees are starting to come down.

Habitat value or capability for elk is presently well below potential relative to forage availability of browse species. Availability of grass types and tree cover is presently toward optimum in the area, but thermal cover is rapidly declining in the Douglas-fir types.

Habitat effectiveness for elk because of open roads in the project area is less than 40% during the late spring, summer, and fall periods.

Effects on Elk and Mule Deer

None of the alternatives relating to this comparatively small, single project are expected to have any measurable effects on forestwide population trends or the population viability of these species.

Alternative I

Habitat value for elk would continue to deteriorate with Alternative I due to loss of browse types associated with riparian, wetland, and aspen, and blockage of movement within stands due to high quantities of large downfall. The area would continue to provide some cover value for elk movement and holding elk during major disturbance. Hiding cover and thermal cover values would decrease in the short-term due to loss of canopy and low structure of regeneration, however in the long-term regeneration resulting from natural thinning of the overstory would result in enhanced hiding cover values.

Habitat effectiveness in the project area would remain below 40% during portions of the year (late spring, summer, fall, and winter) due to the Deadman Bench Road (FSR 144) being open yearlong and winter snowmobiling being allowed. Habitat effectiveness values would decrease slightly from the present value in the short-term due to a decrease in hiding cover because of tree mortality. The remainder of the diversity unit would remain below 40% during all seasons except when the Camp Creek Road is closed (April 1 to July 15). There would be a slight decrease of habitat effectiveness in the short-term in the diversity unit due to continuing tree mortality.

Alternative II

Habitat value for elk relative to forage and browse availability would be enhanced in both the short-term and long-term due to setting back succession and enhancing deciduous species in wetland, riparian, and aspen types. Hiding and thermal cover would be decreased in the short-term, but would gradually increase over the long-term due to advancing succession. *The hiding cover standard of 40% would be maintained, as would the 20% standard for thermal cover.*

Habitat effectiveness would be maintained near the 100% level within the project area during all seasons except during heavy hunting periods. This is because the Deadman Bench Road would be permanently closed to all motorized vehicles and the Deadman Bench/Camp Creek/Reef Creek area would have an area closure restriction on over-snow vehicles during the winter period. The remainder of the diversity unit except for the areas along the Chief Joseph Highway and around developments (i.e., K-Z Resort) would provide habitat effectiveness approaching 100% during the spring/early summer period due to the existing closure restrictions.

Alternative III

Habitat value for elk relative to forage availability would be enhanced in both the short and long-term because succession would be set back. Browse availability would continue to decline because there would be no enhancement of deciduous types. Hiding and thermal cover would be decreased in the short-term, but would gradually increase over the long-term due to advancing succession.

Habitat effectiveness for elk would increase in the project area during the spring/early summer period (April 1 to July 15) because of the seasonal restriction on the relocated Deadman Bench Road. Habitat effectiveness would decrease to less than 20% in the project area during the summer,

fall, and winter periods due to increased motorized use associated with the improved road location and the fact that a portion of the road would be relocated within the timbered area whereas it is presently located in the meadow. The remainder of the diversity unit except for the areas along the Chief Joseph Highway and around developments (i.e., K-Z Resort) would provide habitat effectiveness approaching 100% during the spring/early summer period and less than 40% during the remainder of the year due to the existing closure restrictions (the same situation as it is at present).

Alternative IV

Alternative IV would enhance habitat value for elk relative to forage availability in both the short and long-term as succession would be set back. Browse availability would increase slightly. Hiding and thermal cover would be decreased the greatest degree in the short term, but would gradually increase over the long term as succession advances.

Habitat effectiveness for elk would increase dramatically in both the project area and the diversity unit due to the permanent motorized use restrictions on Deadman Bench, Camp Creek, and Reef Creek.

Existing Conditions for Moose

Moose (*Alces alces*) is a MIS on the Forest that was identified during scoping as a species of concern relative to this proposal. *A viable moose population appears to be in a declining population trend (over the past decade) due primarily to loss of early succession habitat (i.e., riparian and aspen) and predation by grizzly and wolves.* The moose is related primarily to riparian and early succession forested types. Moose winter range overlaps the southeast edge of the Deadman Bench. This area consists of riparian and fir type habitat that moose generally prefer. A portion of these stands was initially treated using a shelterwood harvest system in the late 1960s. Since then, a mixed stand of advanced regeneration has become established in these stands. The regeneration of fir, along with the browse types (aspen, willow, etc.) provide winter forage for moose and are heavily utilized in some areas where young stems exists. In the timbered stands at the base of the reef outcrop, evidence of heavy use by moose is evident (trailing, heavy shrub and aspen browsing, and numerous moose droppings).

Moose winter range overlaps with some stands proposed for treatment. This is the only wild ungulate having designated winter range or birthing areas located within the project area. Effects on critical components of moose habitat relate primarily to riparian areas, browse availability (primarily willow, aspen, and other deciduous species), and the subalpine fir component for winter food and cover.

Shrub species such as aspen, willow, alder, and birch are also important moose habitat components that provide browse throughout the year. Browse species are presently in a declining condition within the project area, with numerous remnant dead clumps (of several species) in the wetland area and adjacent stands still evident. As stated previously, most aspen clones in the area are mature, with declining large stems and minimal regenerating suckers available as browse.

Habitat value or capability for moose is well below the potential (estimated at less than 50% of potential, due to the dominant late successional characteristics.

Habitat effectiveness because of open roads in the project area is less than 40% during the late spring, summer, and fall periods, but is generally much higher during the winter period as little snowmobile use occurs on the bench presently.

Effects on Moose

None of the alternatives relating to this comparatively small, single project are expected to have any measurable effects on forestwide population trends or the population viability of this species.

Alternative I

Alternative I would enhance the amount of subalpine fir regeneration through natural succession. This is because subalpine fir is a late seral species and in some areas where fir is established, loss of overstory trees allows release of young fir due to reduced competition. This alternative would also allow the continuation of the encroachment of conifer species (primarily fir) into the wetland, riparian areas, and deciduous stands. Although fir encroachment would provide a beneficial food source for the winter period, competition from such encroachment would cause a decrease in the availability of deciduous browse, which is also an essential food source for moose. As deciduous vegetation is in a decline, the abundance of these types would decrease in the long-term with many stands deteriorating to the point that they would be lost, unless a major disturbance event such as wildfire occurs.

Alternative II

Alternative II would increase the amount of subalpine fir regeneration to a limited degree. This increase is because it is a shade dependent species and a sufficient amount of the canopy in spruce/fir stands would remain to provide adequate shading for fir regeneration. In addition, removal of mature subalpine fir trees would be minimal as this alternative requires sanitation harvest, and few subalpine fir overstory trees are at high risk.

The other primary component of quality moose habitat is deciduous browse. With this alternative the enhancement of the amount and suckering of aspen and the enhancement of other browse species (willow, birch, etc.) in wetland and riparian areas would occur. Although subalpine fir would be removed from aspen, riparian, and wetland areas, the beneficial effects to deciduous vegetation in the long-term far outweigh the loss of fir in these areas. This is strictly because deciduous species are in a declining mode in the area and could eventually be of insufficient amounts to provide habitat for moose.

Alternatives III and IV

Alternatives III and IV would benefit moose by providing some fir regeneration and maintaining areas of mature spruce/fir. However, all deciduous browse species would continue to decline, adversely affecting moose habitat in the long-term.

Existing Conditions for Blue and Ruffed Grouse

Forest MIS blue grouse *(Dendragapus obscurus)* and ruffed grouse *(Bonasa umbellus)* exist in and adjacent to the project area. *Blue grouse are common throughout the Forest in suited habitat with population trends being stable. Ruffed grouse distribution is much more limited because of limited habitat, and the population appears to be in a declining mode in many areas due to loss of the aspen type and preferred structure.* Ruffed grouse is a MIS related to aspen, and aspen was a significant issue identified during scoping. Therefore, ruffed grouse will be analyzed in depth. Blue grouse are more of a habitat generalist; however, as they also use riparian and deciduous areas and coniferous forest for foraging similar to the ruffed grouse, it is assumed that effects on blue grouse will be similar to those of ruffed grouse. Because of this assumption, blue grouse will be discussed no further.

Existing habitat for ruffed grouse is limited and well below potential, primarily because of the limited amount and old age structure of aspen communities. Multi-storied aspen, shrub types, and riparian habitat are primary components of good grouse habitat. All these types are declining in the

project area due to advancing succession. Grouse numbers are well below potential with two observations in the project area over the past several years.

Effects on Blue and Ruffed Grouse

None of the alternatives relating to this comparatively small, single project are expected to have any measurable effects on forestwide population trends or the population viability of these species.

Alternatives I, III, and IV

As Alternatives I, III, and IV do little to maintain or enhance aspen, the abundance and distribution of the aspen type and seral stages would continue to decline. As a result, use of the area by grouse would decline over the long-term, and populations of ruffed grouse in the immediate area are expected to continue to decline.

Alternative II

Alternative II would benefit all aspen related species in the long-term. Any action that enhances the amount of the aspen type, the age-class distribution of aspen, or causes expansion or suckering of existing clones is beneficial to all aspen related species in the long-term. This is because a mix of structure is provided on a sustainable basis over time, thus eliminating great fluctuations in available habitat and related populations.

Existing Conditions for the Hairy Woodpecker

The hairy woodpecker (*Picoides villosus*) is a MIS for late forest succession and could be affected by this proposal. The hairy woodpecker is a common species dependent on mature aspen; habitat, including numerous snags, exists in the project area.

Effects on the Hairy Woodpecker

None of the alternatives relating to this comparatively small, single project are expected to have any measurable effects on forestwide population trends or the population viability of this species.

Alternative I

With Alternative I, habitat value for the hairy woodpecker would most likely improve due to the increasing number of large snags.

Alternatives II, III, and IV

In the short-term, habitat value for hairy woodpeckers would most likely decrease with implementation of Alternatives II, III, or IV, but in the long-term, sustainable habitat (large aspen snags) would be maintained.

3.5.13 Sensitive Wildlife Species

Dwarf Shrew and Water Vole

Many small mammals exist in the area, and suitable habitat exists within the project area for sensitive species such as the dwarf shrew *(Sorex nanus)* and the water vole *(Microtus richardsoni)*. They live in underground burrows and feed above ground or in the water**.** Because major ground disturbing activities such as road building are limited relative to this proposal, and because activity in the riparian area and wetland areas are severely restricted due to project design, this proposal has little potential to impact either shrews or water voles.

Any of the action alternatives may impact individuals but is not likely to cause a trend to federal listing or loss of viability of these species; therefore they will be discussed no further.

Columbia Spotted Frog, Northern Leopard Frog, Tiger Salamander, Western Boreal Toad

Wetland and riparian types provide the primary habitat for most amphibians, as they are usually found near a permanent water source. Sensitive species that are likely present in the proposed project area are the Columbia spotted frog *(Rana pretiosa)*, northern leopard frog *(Rana pipiens)*, tiger salamander *(Ambystoma tigrinum)*, and western boreal toad *(Bufo boreas boreas)*.

Few surveys have been completed for these species on the Forest. However, in 1994, Chris Garber (The Nature Conservancy, Cheyenne Wyoming) conducted a survey along the Chief Joseph Highway. One Columbia spotted frog response was recorded from an area adjoining the proposed project area. The western boreal toad, northern leopard frog, and tiger salamander may also be present. The wetland area and riparian area within the proposed project area are likely to provide habitat for these species

Because of the design standards that require winter logging in the riparian and wetland areas when these species are hibernating deep underground, impacts to amphibians or their habitat would be minimal. Due to enhancement of the water table in these areas in the long-term, the proposal should have beneficial effects on amphibians.

Any of the action alternatives may impact individuals but is not likely to cause a trend to federal listing or loss of viability of these species; therefore they will be discussed no further.

Existing Conditions for Sensitive Birds Associated with Mature Forest

Northern goshawk, northern three-toed woodpecker, black-backed woodpecker, olive-sided flycatcher, golden-crowned kinglet, pygmy nuthatch, and boreal owl. The northern goshawk (*Accipiter gentiles*) and the northern three-toed woodpecker *(Picoides tridactylus)*, black-backed woodpecker *(Poicoides arcticus)*, olive-sided flycatcher (*Contopus borealis)*, golden-crowned kinglet *(Regulus astapa)*, pygmy nuthatch (*Sitta pygmaea*) and boreal owl *(Aegolius funereus)* are sensitive species that could potentially be affected by this proposal. *Although population trends for all these species are not known, based upon known occurrence data it appears that populations are viable. The goshawk is common on the Forest. Limited surveys indicate boreal owls are present in some areas.*

The general habitat preference for this group is mature coniferous forest or mature coniferous forest mixed with aspen. All except the goshawk and golden-crowned kinglet require or use snags to a high degree. There has been over the past decade, and would continue to be a tremendous recruitment of conifer snags over the majority of the proposed treatment in the next several decades. Aspen snags are presently available in low densities due to the over mature status of aspen clones, but would be in limited supply in the future due to the eventual loss of aspen clones due to the lack of disturbance.

The goshawk prefers a relatively high-density canopy (>40%) over the majority of their home range. The northern three-toed woodpecker and the olive-sided flycatcher are especially attracted to forested areas that have burned portions with abundant snags. Burned areas adjacent to the proposed project area have tremendous amounts of snags available, and would have for decades in the future.

Effects on Sensitive Birds Associated with Mature Forest

None of the alternatives relating to this comparatively small, single project are expected to have any measurable effects on forestwide population trends or the population viability of these species.

Alternative I

With Alternative I, habitat value for the northern three-toed woodpecker, black-backed woodpecker olive-sided flycatcher, golden-crowned kinglet, pygmy nuthatch, and boreal owl would continue to improve for the next several decades due to the increasing number of large snags. The quality of goshawk habitat would decline due to the loss of the overhead canopy.

Alternatives II, III, and IV

With implementation of Alternatives II, III, and IV a decline in habitat value in both the short-term and long-term is expected. This is due to the decrease in the number as well as in the recruitment of large snags. Alternative IV causes the greatest loss in habitat value as more trees are removed resulting in less recruitment of snags over the long-term.

However, habitat conditions to assure viability of all these species within the project area were part of the design criteria with patches and corridors of mature forest being left untreated. For these sensitive bird species, any one of the action alternatives may affect individuals but are not likely to cause a trend to federal listing or loss of viability of the species.

Existing Conditions for Pine Marten, Fisher, and Wolverine

Potential habitat does exist in the project area for pine marten, fisher, and wolverine. All of these sensitive species are generally forest dwelling species requiring some complex, large physical structures commonly associated with mesic (requiring moderate moisture) late-succession forest, and all generally avoid large open areas such as large meadows or clear cuts.

Canopy cover over 50% appears to be preferred, and areas having less than 30% canopy cover appear to be avoided. Removal of canopy often affects these species adversely, depending on the scale of canopy removal. Physical structure of the forest appears to be more important than species composition of the vegetation, and while suitable habitat is not necessarily old growth, there is little question that some preferred components are representative of old growth structures. Such forest structure can be characterized by a diversity of tree sizes and shapes, light gaps and associated understory vegetation, snags, fallen trees and limbs, and limbs and other shrubby vegetation close to the ground. There appears to be a preference and a need for structure near the ground, especially during the winter.

Stands in which dens of marten, fisher, and (to a lesser extent) wolverine have been found are characterized by downfall, snags, large trees, hollow trees, and stumps. Until more definitive information on habitat of these carnivores becomes available, it appears that denning habitat can be provided by preserving and recruiting large snags, decadent broken-top trees, and downfall as potential components of structural diversity necessary for den sites in closed-canopy forests.

Pine marten. The pine marten *(Martes americana*), a Forest Management Indicator Species for late succession coniferous forest, prefers habitat that includes some late succession stands of mesic coniferous forest in contiguous blocks with a high degree of canopy closure; a large amount of dead, down and decaying woody material; and a complex physical structure near the ground. *Viable populations of marten exist on the Forest and are common in suitable habitat. Population trends appear to be stable as trappers still consistently harvest individuals as allowed by State regulations. No specific surveys have been conducted for the marten* in the project area, however it is highly likely that pine marten use the proposed project area. A local resident, living next to the project area, reports marten using his property.

Fisher. The fisher (*Martes pennanti*) also prefers habitat that includes late succession coniferous forests with high canopy closure during the warmer seasons, and young to mature forests in the winter. The only report of fishers on the Clarks Fork District was in 1920 when two were trapped near Beartooth Lake. Several fishers have been recorded in the northeast portion of Yellowstone

National Park adjoining the Clarks Fork District within the past few years. *Nonetheless, there are no confirmations of this species in the state of Wyoming (Oakleaf, personal communication). It is possible that the fisher could use the project area.*

Wolverine. *Based upon reports and data over the past decade, it appears that wolverines may be making a slow comeback on the Forest, but a viable population is very questionable. They are still extremely rare in the area.* The presence of wolverine *(Gulo gulo)* was documented by observation in Sunlight Basin in 1996 (Luce, personal communication 1996) and by track surveys during the winter of 2001/2002 in the Crandall area. Wolverine could use the project area. Preferred habitat is generally high elevation habitat during the summer and lower elevation forested areas during the winter. Wolverines are very wide ranging and appear to be very intolerant of human activity.

Late seral forests dominate the project area. Pine marten and fisher, which require large blocks of undisturbed late seral, forested habitat to accommodate their home range sizes, could persist in the existing habitat, and may in fact be present. Some habitat diversity exists as well, providing somewhat of a prey base, however there is a noticeable absence of snowshoe hares, grouse, and other small mammals to supply these predators with a broad prey base. Retaining the present habitat structure (large down, decaying wood, canopy closure exceeding 70 percent, spruce/fir type) would encourage the persistence of a likely pine marten population, and provide habitat for other species. However, it must be noted that retention of this structure is not possible due to natural disturbances such as insect infestation and the deteriorating condition of many of the old-age stands.

Effects on Pine Marten, Fisher, and Wolverine

Habitat conditions to assure viability of the species within the area were part of the design criteria. Some existing areas of potential denning habitat and foraging habitat would be maintained (not treated) in all action alternatives.

None of the alternatives relating to this comparatively small, single project are expected to have any measurable effects on forestwide population trends or the population viability of these species.

Alternative I

Under Alternative I, given the incidence of insects and the risk of wildfire, habitat structure is expected to change within the project area. Loss of the overhead canopy associated with large trees is predictable due to insect mortality and this would decrease habitat value for these species. Large dead and down material is presently increasing and would continue to do so in the near future. Increased amounts of dead and down would be beneficial to these species.

Alternatives II, III, and IV

Alternatives II, III, and IV would result in a decrease in habitat value for marten, fisher, and wolverine in the short-term because of the decrease in canopy coverage and a decrease in dead and down material.

In the short-term, any of the action alternatives would increase human activity during the treatment period, thus decreasing habitat effectiveness during this period. However, the long-term effects of any of the action alternatives on habitat effectiveness for these species would be beneficial because of road restrictions and road decommissioning. Long-term, any of the action alternatives would contribute to providing a mosaic of types and seral stages, and likely higher populations of prey species that would be beneficial and sustainable over time.

Because of the above factors, any of the action alternatives may affect individuals but are not likely to cause a trend to federal listing or loss of viability of the species.

3.5.14 Threatened, Endangered, and Proposed Species

The U.S. Fish and Wildlife Service has indicated there are seven threatened, endangered, or proposed wildlife species that may occur on or be affected by activities on the Shoshone National Forest. These wildlife species include the threatened grizzly bear (*Ursus arctos horribilis*) and bald eagle (*Haliaeetus leucocephalus*), as well as the endangered black-footed ferret (*Mustela nigripes*), whooping crane (*Grus americana*), and Canada lynx (*Lynx canadensis*). The gray wolf (*Canis lupus*) is also included, subject to being an experimental population and treated as a proposed species. The mountain plover (*Charadrius mintanus*) is a proposed species.

The black-footed ferret, whooping crane, and mountain plover will not be discussed further (*see* Figure 10).

Gray Wolf

The gray wolf, a Management Indicator Species on the Forest, was reintroduced in Yellowstone National Park area in 1995 and is presently designated as a non-essential experimental population and treated as a proposed species. This designation provides greater flexibility in the management of wolves and allows greater accommodation in land use activities. *A healthy, sustainable, and viable population of wolves is using parts of the Shoshone Forest, and all indications are that the population trend is upward.* The gray wolf is known to use the project area, however as it is an experimental population and six breeding pairs have been established, no land use restrictions may be employed on national forest lands as wolf population growth rates have remained positive toward population recovery levels (50 CFR Part 17.84(xii)(4)).

Because population growth rates exceed the required level, and as this proposal would not adversely affect the prey base of the species, this action is not likely to jeopardize the continued existence or adversely modify proposed critical habitat of the experimental population, the wolf will be discussed no further.

Bald Eagle

Bald eagles are a Management Indicator Species as well as being listed as threatened. *There is not a viable population of eagles on the Forest. No nesting sites are known; major use is during the wintering period along major rivers on the Forest. Use trends appear to be stable.* A few individuals and are known to winter along the lower Clarks Fork River. The climate and elevation along the upper stretch of the river limit use by bald eagles. The project area is approximately one mile from the nearest stretch of the upper river. Use of the project area by bald eagles for nesting or foraging is not known or expected.

Because no suited habitat could be affected, and because the species does not use the area potentially affected by this proposal, this action is not likely to adversely affect the bald eagle or its habitat, therefore this species will be discussed no further.

Existing Conditions for Canada Lynx

There is no data in the historical record to indicate that there has ever been a healthy, self-sustaining population of lynx on the Shoshone National Forest. Only a limited number of reports on sightings or trappings of individual animals are documented over the past century. Lynx have been recorded at several locations during the past several decades on the Clarks Fork Ranger District, ranging from the Sunlight area to the northeast entrance to Yellowstone Park, with most concentrated in the Swamp Lake Botanical Area and Beartooth Mountains. Hair sampling during the summer of 1999 also documented the presence of lynx in the Beartooth area north of the project area. Snow tracking during the winter of 2001-2002 failed to substantiate the presence of lynx in the Crandall/Sunlight area.

The following discussion is based on information contained in the Canada Lynx Conservation Assessment and Strategy and the *Ecology and Conservation of Lynx in the United States* (Ruggiero 1999).

The project area is within the Shoshone NF Lynx Analysis Unit (LAU) #4, which is 120,857 acres. The LAU is shown in Figure 11. Only 6.6% of the potential lynx habitat was determined to be unsuitable (due to burned areas*), leaving 93.4% as suitable habitat. If the total 336 acres proposed for treatment with this proposal were to become unsuitable (which it is not), approximately 93.1% of the habitat would remain suitable, which exceeds the 70% standard required by the Lynx Conservation Strategy.*

Timber management actions in the last 10 years consisted of small post-fire salvage sales. The area disturbed does not approach the percentage that can be converted from potential habitat to unsuitable habitat during any decade. It is well below the 15% conversion to unsuitable habitat standard in the Lynx Conservation Strategy.

The standard from the Lynx Conservation Strategy for denning habitat is that 10% of identified potential lynx habitat in a LAU must be maintained as denning habitat in patch sizes of at least five acres. This project would maintain approximately 19% of the potential lynx habitat as denning habitat of appropriate size.

Lynx require late seral stage forests or older regenerating stands (more than 20 years since disturbance) for denning. The most common component of den sites appears to be large woody debris, either down logs or root wads. A portion (20 to 25%) of the proposed project area presently contains large woody debris, and the majority of the area will recruit high volumes of large dead and down material in the next two decades. Denning habitat does not appear to be a limiting factor.

Their major food sources are snowshoe hares and red squirrel. The availability of snowshoe hares during the winter period appears to be the limiting factor on lynx populations. A snowshoe hare density of more than one per 2½ acres appears adequate to support a viable lynx population. Nowhere on the Shoshone, nor in the proposed project area, has this density been documented or is it suspected. Alternate prey species such as pine squirrel and small rodents are quite common in the proposed project area. Ruffed grouse, another alternate prey species of the lynx, is very limited in the proposed project area due to the mature and declining status of the aspen.

Lynx foraging habitat is generally one of two types:

- Early successional young forest where dense, multi-layered understory maximizes cover from ground level up to six feet. Within the proposed project area, due to the loss of the overstory canopy, conifer regeneration is occurring, and will continue to increase for several decades.
- Older forests with a substantial understory of conifers or small patches of shrubs and young trees that provide dense cover that touches the snow in winter; and/or dead and down material that protrudes above the snow. Some portions of the project area meet these criteria.

Young, densely regenerating aspen stands with a well-developed understory also provide good quality habitat for snowshoe hares and other potential lynx prey species, such as grouse, if there is sufficient ground cover within the stand. Recruitment of aspen stands with a high density of stems per unit area is a priority for hares. There are no aspen stands in the proposed project area having a high density of stems, and the amount of aspen is declining due to deteriorating clones as a result of apical dominance and conifer encroachment.

Vegetation structure in the understory appears to be more important for hare abundance than does species composition. A complex mosaic of species and age classes is likely to provide the best overall habitat over the long-term for the lynx, although it appears that spruce-fir habitat types

where lodgepole pine is a major seral species is a basic component of good lynx habitat. Little lodgepole pine exists in the project area, and the landscape pattern is mostly a continuum of the over mature age-classes due to the late succession status.

Because they require large home ranges and stands of late seral forest intermixed with early succession multi-layered forest, the project area contains potential habitat for the lynx, either with specific silvicultural treatment to enhance conditions for lynx, or without treatment. Connectivity within the project area is excellent at present. Connectivity within the diversity unit is limited within much of the burn area.

During field work in late winter of 2000 and 2001, snowshoe hare tracks were not a common occurrence in the Reef Creek and Deadman Creek areas and actual hare sightings were very rare. Occurrence of hare pellet groups in the summer of 2001 and snow tracking during the winter of 2001/2002 does indicate use by hares. It appears that the potential does exist for silviculturally enhancing the project area for snowshoe hares in the long-term by recruiting high-density conifers, hardwoods, and shrubs.

Effects on Canada Lynx

None of the alternatives relating to this comparatively small, single project are expected to have any measurable effects on forestwide population trends or the population viability of this species.

Although it is unlikely that lynx use this habitat to a high degree, the potential does exist for having a beneficial effect on habitat in the long-term with several of the alternatives.

Alternative I

Alternative I would result in mortality of many of the large trees in the area from insects. The resulting complex dead and down component providing high vertical structure near the ground would provide high quality sites for denning purposes, and good escape cover for the snowshoe hare, the primary prey species. The natural thinning of the overstory that results in high levels of regeneration has the potential to provide both food and cover for the snowshoe hare. As most of the regeneration would be fir, the primary limiting factor would most likely be the absence of lodgepole pine regeneration and browse species, the preferred food sources for the hare.

Alternative II

Alternative II also provides opportunities for enhancement of lynx habitat. Maintenance of areas of mature timber having much dead and down would provide suitable denning and winter habitat. As over 400 acres of timberland within the treatment area are not being treated, and a major portion would meet the criteria for denning habitat, denning habitat is not limiting in the project area. As the limiting factor appears to the lack of an adequate winter food source, enhancement of riparian, aspen, and lodgepole pine would result in additional browse for prey species such as hares and grouse. Overall, the mosaic of types and structure distributed throughout the area (resulting from treatment) would benefit prey species and the lynx.

Alternatives III and IV

Alternatives III and IV would not directly enhance habitat for the lynx. This is because they would not enhance minority species such as aspen and lodgepole pine, nor would they enhance habitat of any of the primary prey species. In addition, Alternative IV reduces the overhead canopy to such a degree that treated stands would generally be avoided by lynx.

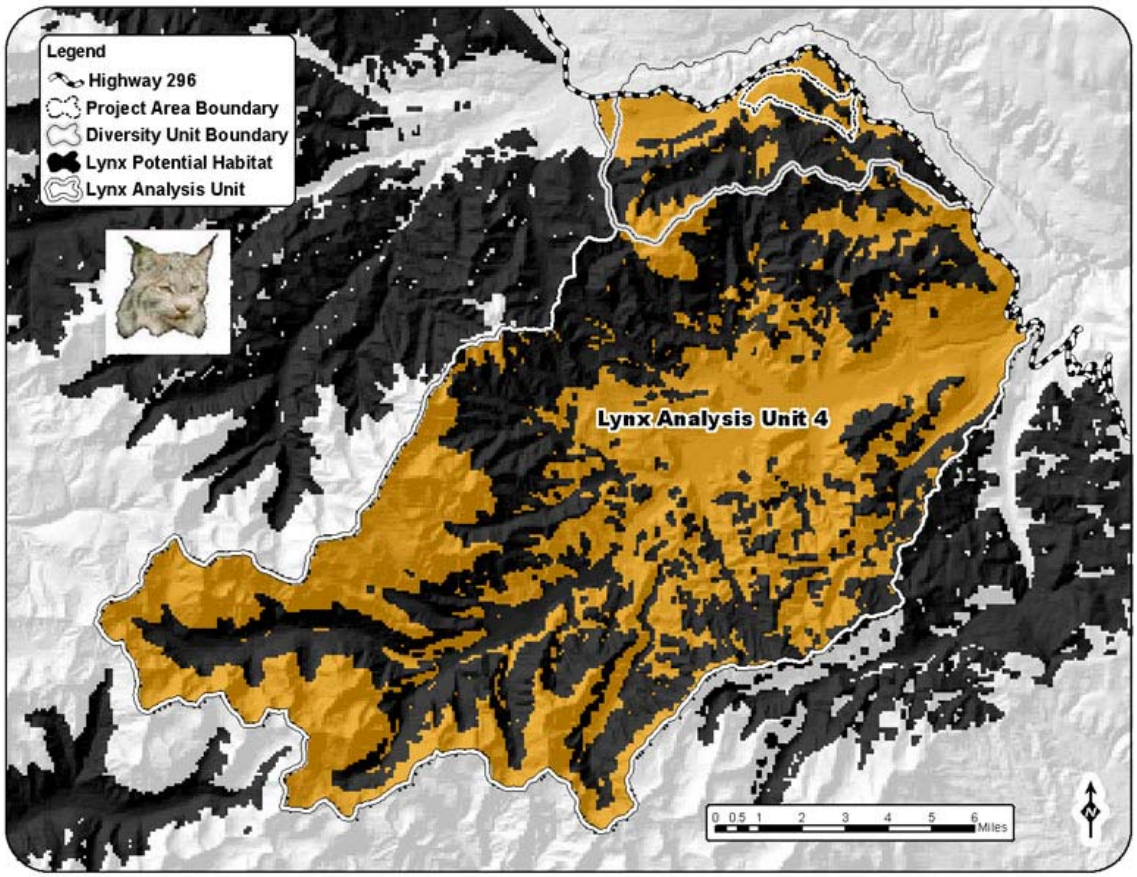


Figure 11. *The proposed project area is within the Shoshone National Forest Lynx Analysis Unit (LAU) #4. This LAU is 120,857 acres.*

Grizzly Bears

The grizzly bear, a listed -threatened species and a Forest MIS, occurs in the project area. It was also identified during scoping as a species of concern regarding this proposal. The proposed project area lies within Management Situations 1 and 3 inside the grizzly bear recovery zone. Grizzly Bear Management Situations in relation to the diversity unit are shown in Figure 12. *The grizzly bear population trend has been upward on the Forest since the mid-1980s; a healthy, viable population exists. The Draft Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area is in the process of being finalized.*

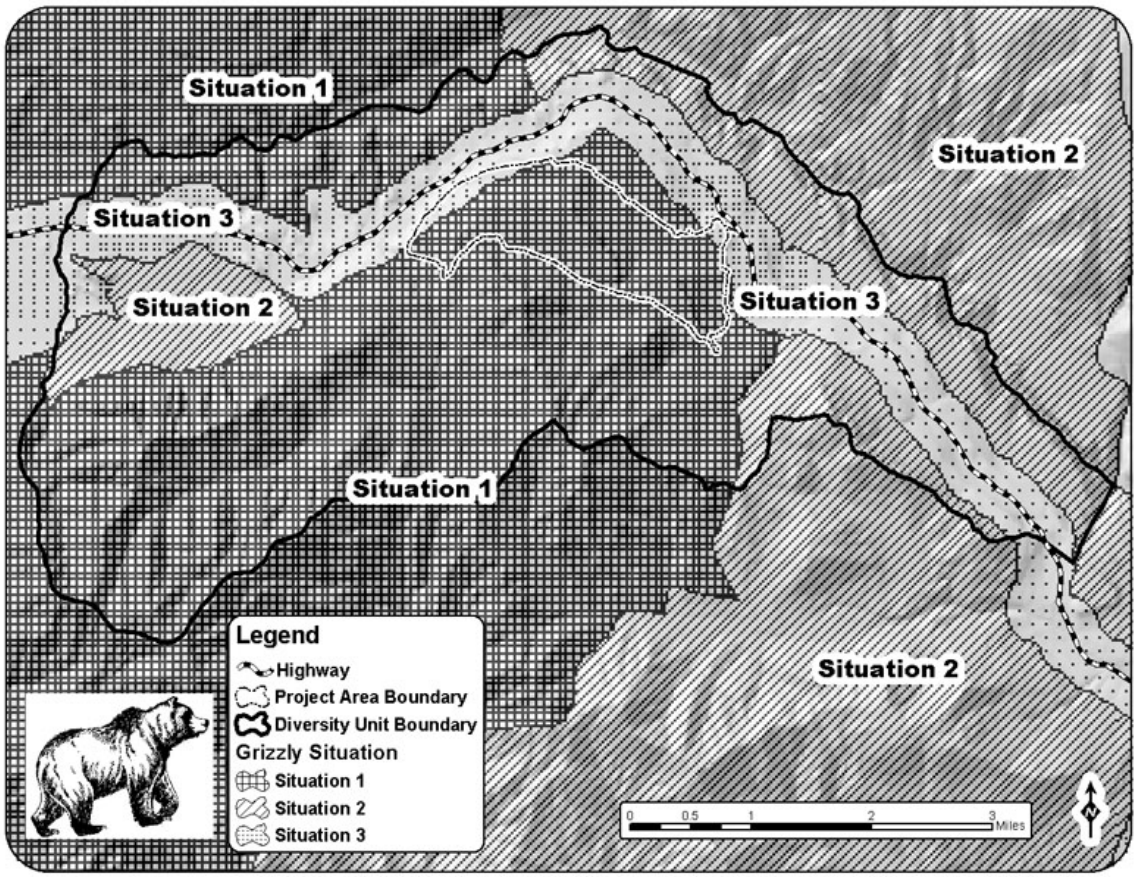


Figure 12. *The proposed project area lies within Management Situations 1 and 3 inside the grizzly bear recovery zone.*

In order for grizzly bears to persist in a given area, the habitat must provide the elements required for their survival. Grizzly bears are opportunistic omnivores making them very flexible in their food habits. In some areas, grizzly bears may be almost entirely herbivorous while in other areas they are largely carnivorous. Bears must seek foods rich in protein, fat, or carbohydrates in order to obtain enough calories to survive denning and post-denning periods. Grizzlies spend much of their time searching for energy-rich foods and the search for food strongly influences bear movements. Diverse structural stages of vegetation that support many plant species and animals are needed to meet the energy demands of the grizzly. Bears consume animal matter, roots, bulbs, tubers, fungi and tree cambium, berries, seeds, and fish (Craighead et al. 1995).

Existing Condition of Grizzly Bear Habitat Value

The purpose of this analysis is to demonstrate the relative seasonal habitat values of the surrounding area to the grizzly bear. The vegetation map from Grizzly Bear Cumulative Effects Model (CEM) along with the habitat value coefficients for each habitat component were used to calculate habitat values for each of the four seasons within the Bear Management Unit (BMU) subunit and the diversity unit. The appropriate level for analysis of grizzly bear habitat value is at the subunit level (roughly the size of the annual home range of an adult female). Habitat values were also determined for the diversity unit for consistency with other analysis in this document. Coefficients representing an average year as identified in Mattson (1999) were used. These coefficients vary between seasons but are comparable across seasons and reflect the energy and nutrients derived by grizzly bears

from mapped vegetation types. The six average annual numeric output categories defined in Mattson (1999) were combined into three qualitative categories for this analysis.

In a general sense, habitat values increase from spring until hibernation in subunits across the GYA (Greater Yellowstone Area). Exceptions are that some of the highest values occur during estrus and hyperphagia (pre-hibernation) in the few subunits that contain spawning cutthroat trout and army cutworm moth aggregations. Crandall/Sunlight subunit 2 roughly represents an average subunit and does not provide spawning cutthroat trout or army cutworm moths for foraging bears. The diversity unit exhibits somewhat higher values for each season, except spring, than the subunit as a whole. Spring values for the diversity unit are similar to the subunit values.

Season	**Crandall/Sunlight BMU Subunit** 202,342 acres	**Diversity Unit** 15,767 acres
Spring Season (March 1 - May 15)	47% low value habitat 52% moderate value 1% high value habitat	49% low value habitat 50% moderate value 1% high value habitat
Estrus Season (May 16 - July 15)	29% low value habitat 70% moderate value 2% high value habitat	24% low value habitat 74% moderate value 2% high value habitat
Early Hyperphagia (July 16 - August 31)	28% low value habitat 55% moderate value 17% high value habitat	41% low value habitat 19% moderate value 41% high value habitat
Late Hyperphagia (September 1 - November 30)	49% low value habitat 19% moderate value 32% high value habitat	30% low value habitat 36% moderate value 34% high value habitat

Figure 13. *Percent of specified area in various CEM habitat value categories by season.*

The grizzly bear currently uses the Deadman Bench area primarily during the spring (Larry Roop, personal communication 1996), and bears and sign were commonly observed within the project area during the spring of 2000, 2001, and 2002. Several young bears used the area during the summer of 2000; six bears were trapped just above the reef near Deadman springs in the spring of 2001, and a female with cubs was observed in 2002. Use also occurs during the fall hunting season because of cripples, carcass remains, and gut piles.

Based on observations, early green-up occurs in the Reef and Camp Creek drainages while surrounding drainages and hillsides are yet dormant (Barker, personal communication 2002). This area is very important to bears during the spring period, more so than is indicated by the above Table 12, as it provides a major source of foods. Protein rich foods are needed in early spring when bears emerge from denning, in order to put on weight and for lactating females with cubs. Succulent vegetation, carrion, and elk calves provide the major protein sources for bears in spring and early summer.

Identified big game crucial ranges (winter and birthing) generally lie outside the proposed project area. However, numerous elk cows, doe deer, and a few moose cows were observed during the core-birthing period (late May and early June) over a several year period. This indicates it is used during the calving period, especially when the high country is still snowed in. The closest

established and documented elk calving areas are within several miles of the project area, and are located above the reef in the Camp Creek, Deadman Creek, Reef Creek, and Russell Creek drainages just south of the project area. Approximately 60% of the diversity unit provides the potential for supplemental ungulate protein food for grizzly bears. All major protein areas as presently mapped are outside the proposed project area.

Based on the above factors, it appears that bear use of the project area is high, and seasonal habitat values within the project area are relatively high in comparison to adjacent areas, especially during the critical spring period. Based on field examination, it is also apparent that there are opportunities within the project area to enhance habitat values for bears by enhancing deciduous vegetation, succulent vegetation types, and spring habitat for big game prey species.

Effects on Grizzly Bear Habitat Value

The habitat value coefficients in the CEM are stratified by forest type, habitat type, age of stand (mature and created openings), distance from a natural edge, and the presence or absence of ungulate wintering ranges. Coefficients are generalized for the same vegetation type of the same age and are not sensitive to differences in stocking rates, understory productivity, and stand characteristics. Treatments that increase productivity and overall stand health without significant canopy removal will not reflect in the habitat values for the mapped vegetation types. As such, changes in CEM habitat values cannot be effectively evaluated for each alternative.

Habitat foraging value for grizzly bears would be enhanced by any of the alternatives as the understory forb and shrub types that provide food sources would be increased due to the overstory canopy being reduced, either by natural thinning by insects or by timber harvest. Alternative I would increase habitat value the least amount, as there would be no soil scarification to provide a seed bed for understory vegetation. Alternative II would enhance foraging value the greatest amount when compared to other alternatives as restoration of the wetland and riparian areas to an earlier seral stage would favor many species of succulent vegetation and some berry producing species favored by bears.

Existing Condition of Grizzly Bear Habitat Effectiveness

The existing motorized access route density and secure area percentages for the subunit and the diversity unit are displayed in Figures 14 and 15. The existing situation in this subunit is the same as the 1998 base line. The Crandall/Sunlight subunit 2 is one of 40 subunits in the grizzly bear recovery zone in the GYA. It has not been identified as a subunit needing improvement. However, this subunit has the highest Open Road Access Route Density (OMARD) and Total Motorized Access Route Density (TMARD) 1998 base values of all subunits on the Shoshone National Forest.

Seasonal habitat effectiveness values are low to moderate in the project area, due primarily to the open roads and associated human activities. Therefore, there are opportunities for enhancement of habitat effectiveness values using access management options.

Motorized Access Route Density and Secure Areas in Grizzly Bear Habitat

Studies of the effects of roads on grizzly bears generally have shown that bears are displaced by vehicular use and that whether the road is a primary, secondary, or tertiary road has little to do with the displacement (Zager 1980; McLellan and Shackelton 1988). Significantly less use of habitat within 250 meters of a roadway occurs. McLellan and Shackelton (1988) in a seven-year study of 27 collared bears, concluded that when roads are developed in grizzly bear habitat, bear populations become highly vulnerable unless vehicle access and people with firearms are controlled. Bears may use roadways and adjacent areas under cover of night but avoid them during daytime. More recent research in Montana (Mace and Manley 1993; Mace et. al. 1996) noted that in addition to open road density, total motorized access route density and areas free of motorized access and high levels of

non motorized use (secure areas) are important factors influencing grizzly bear use of habitats. These secure areas are especially important to females for rearing cubs.

In 1994, a task force of the Interagency Grizzly Bear Committee produced the Grizzly Bear/Motorized Access Management report. Concerns over inconsistencies in road density management across grizzly bear ecosystems and new research on the effects of motorized access route density on grizzly bear habitat use prompted the effort. The report contains standard definitions for access routes and outlines the methodology and procedures for conducting motorized access route density and secure area analysis. The analysis process uses a geographic information system that identifies the percent of motorized access route density in various categories within the diversity unit. This process is independent of the size of the analysis area unlike the traditional method of dividing the miles of road within a boundary by the area of the boundary. This allows values to be compared among project areas regardless of their size. The report was revised in 1998 to allow for differences in available data and bear habitat use within the various grizzly bear ecosystems (IGBC 1998).

Specific access features included and methodology that apply within the Yellowstone grizzly bear recovery zone are outlined in the1998 report of the Interagency Grizzly Bear Study Team (Barber and Ouren 1998). The Draft Conservation Strategy for the Grizzly Bear in the Yellowstone Area (ICST 2000) identifies specific motorized access standards that will be applied if the grizzly bear is removed from protection under the Endangered Species Act. These standards specify that the percent of open motorized access route density (OMARD) greater than one mile per square mile and total motorized access route density (TMARD) greater than two miles per square mile within subunits will not increase and the percent of secure habitat will not decrease. An exception for habitat management allows a temporary 1% increase in OMARD and TMARD within subunits and a similar decrease in secure habitat. Projects must be completed within three years. These standards are based on a 1998 base line map of access features in the grizzly bear recovery zone. It is expected that final habitat criteria will be similar to those in the draft.

The analysis for OMARD, TMARD, and secure area within the GYA is conducted for two seasons. Season 1 is March 1 through July 15 and season 2 is July 16 through November 30. Bear habitat use differs between seasons and so does the management and use of motorized access routes. In general, a motorized access route is considered open if it receives motorized use for a single day during that season. *Total motorized access routes include all open access routes and those routes not effectively closed with gates or permanent barriers. Motorized routes that have been treated to no longer function as roads by decommissioning or obliteration are not included in the analysis of motorized access route density.*

Secure areas are defined as areas with no motorized use during the season. *Secure areas cannot contain gated routes, but access routes having more permanent barriers to ensure effective closure are allowed. The assumption was that many gates are not effective barriers in precluding motorized use.* Secure areas are a minimum of 500 meters from any open or gated road or motorized trail or high use non-motorized trail. Areas identified through the analysis process as having open motorized access route density greater than one mile per square mile cannot be considered secure habitat. Secure areas must be greater than 10 acres. Motorized access route density and secure areas are not evaluated during the denning period of bears from December 1 through the end of February (ICST 2000; Barber and Ouren 1998).

Bear Management Units (BMUs) were delineated for the Yellowstone grizzly bear recovery zone in order to evaluate the effects of human activities without having the effects diluted by consideration of too large an area and to closely match grizzly bear habitat use patterns. BMUs have proven to be the appropriate scale for monitoring of population parameters. Subunits are subdivisions of BMUs and provide a more appropriate scale for evaluation of habitat parameters for grizzly bears (Weaver

et al. 1986; USFWS 1993; ICST 2000). The proposed project is located in subunit 2 of the Crandall/Sunlight BMU.

Access parameters as identified in the Draft Grizzly Bear Conservation Strategy (ICST 2000) were evaluated for each of the two seasons for Crandall/Sunlight subunit 2 for all alternatives. Although the established scale for evaluation of the effects of motorized access on grizzly bears is at the subunit level, this analysis also displays values for the diversity unit for consistency with other analysis in this document.

Effects on Grizzly Bear Habitat Effectiveness

Figures 14 and 15 display motorized access route (MARD) density and secure habitat within the EA diversity unit and the bear management subunit during and after project completion. Percentages of open MARD and secure habitat during each of two seasons are shown for each alternative. The two seasons are season 1, March 1 to July 15, and season 2, July 16 to November 30. Total MARD is presented as an annual value. A decrease in open MARD and total MARD is beneficial for bears, and an increase in secure habitat is beneficial for bears.

During project activities, all action alternatives would result in a short-term increase in total MARD in the diversity unit due to the temporary roading required for project implementation. Open MARD would decrease with all alternatives during harvest operations, as several sections of road would be decommissioned before harvest activities. Even though public access to the Deadman Bench would be *closed* yearlong, this analysis considers these roads open *during treatment activity.*

After treatment, the level of administrative activity would preclude consideration as a closed road during season 2. It was assumed that the Camp Creek and Deadman Bench Road system would be effectively closed during season 1 because 1) two well-placed gates with ancillary structures as necessary would have to be circumvented, 2) no timber harvest, K-V, power line maintenance, or other administrative activity would be planned during this period, 3) road conditions during much of this period would not be compatible with motorized travel (deep snowdrifts in some areas and very wet conditions during some periods).

Secure habitat would increase in the diversity unit during season 1 due to the road decommissioning but would decrease in season 2 during harvest activities (*see* Figures 14 and 15).

ALTERNATIVE	Open MARD 1 mi/square mile season 1/season 2	Total MARD 2 mi/square mile	Secure habitat
Alternative I Existing Condition	40.6%/53.7%	45.2%	37.7%/35.2%
During Project All Alternatives	34.3/51.8 (decrease)	46.9 (increase)	38.0/34.4 (increase/decrease)
Alternative II *after treatment*	34.3%/40.6% (decrease)	44.9% (decrease)	38.4%/36.0% (increase)
Alternative III *after treatment*	34.3%/53.4% (decrease)	44.9% (decrease)	38.4%35.4% (increase)
Alternative IV *after treatment*	34.3%/37.3% (decrease)	44.9% (decrease)	38.4%/37.3% (increase)

Figure 14. *Percent of open and total motorized access route density (MARD) and secure habitat during each of two seasons in the diversity unit for each alternative.*

Effects at the subunit level are not as obvious due to the washout effect of the larger area. Data is presented below for the subunit to demonstrate consistency with the draft *Conservation Strategy* standard that allows a temporary 1% increase in OMARD and TMARD and a 1% decrease in secure habitat.

ALTERNATIVE	Open MARD 1 mi/square mile season 1/season 2	Total MARD 2 mi/square mile	Secure habitat season 1/season 2
Alternative I Existing Condition	14.8/16.0	10.5	81.3/79.9
During Project All Alternatives	14.3/16.0 no change)	10.7 (increase *< 1%)*	81.3/79.9 (no change)
Alternative II *after treatment*	14.3/15.7 (decrease)	10.5 (no change)	81.3/80.0 (no change/increase)
Alternative III *after treatment*	14.3/16.0 (no change)	10.5 (no change)	81.3/79.9 (no change)
Alternative IV *after treatment*	14.3/14.7 (decrease)	10.5 (no change)	81.3/80.1 (no change/increase)

Figure 15. *Percent of open and total motorized access route density (MARD) and secure habitat during each of two seasons in the Crandall/Sunlight Bear Management Subunit #2 for each alternative.*

Each action alternative would result in a similar increase in habitat effectiveness due to the decommissioning of several sections of existing road common to each alternative. Additional changes in habitat effectiveness are a result of how access is managed after project completion.

Alternative I

Alternative I would allow the amount of secure habitat and habitat effectiveness for grizzly bear to remain at the present level, as there would be no change from the existing condition in total road densities or the amount of open roads.

Alternative II

Alternative II would allow long-term habitat effectiveness for grizzly bear to be enhanced on the Deadman Bench due to the permanent yearlong restriction on public motorized use on the Deadman Bench Road. *Within the project area, open road density and total road density would decrease and secure habitat would increase.* Although much of the Deadman Bench is within the zones of influence from motorized use from the Chief Joseph Highway and the Reef Creek Road, its location and topography (on a bench out of sight from the highway) tend to negate some of the effects of vehicular activity occurring along the Chief Joseph highway. Therefore, restricting motorized use of this road would provide a limited amount of additional secure habitat for bears. Due to the apparent importance of this area to bears in the spring, any additional secure habitat is a major factor relative to bear use.

Alternative III

Alternative III would result in an increase in habitat effectiveness in the project area during the spring period when the seasonal restriction on motorized use would be in place. However, during the remaining use seasons, habitat effectiveness would decrease *as open road density and total road density would remain relatively stable, and secure habitat would decrease.* This is because the newly constructed access road would remain open seasonally, thus allowing motorized use to occur within timbered areas that presently provides secure habitat for the bear (the timbered area adjacent to the wetland and portions of the riparian influence zone of Deadman Creek). The existing road in

this area is located in the meadow and does not bisect these timbered areas. Use of this newly constructed road through the timbered area would be occurring at the same time that the quality and quantity of hiding cover would be decreased due to the removal of trees.

Alternative IV

Within the diversity unit, open road density and total road density would decrease significantly, and the amount of secure habitat would increase. Alternative IV would enhance habitat effectiveness and secure habitat to the highest degree, as public motorized access would be permanently restricted yearlong not only in the Deadman Bench project area, but in the Reef Creek and Camp Creek areas as well. Alternative IV also requires reentry for the final removal cut, once regeneration is well established. This would increase the amount of disturbance from harvest activities over the short-term. However, due to this being Grizzly Bear Situation 1 habitat, reentry for timber harvest purposes cannot occur within one decade of the initiation of the sale. In addition, reentry would be prohibited unless 40% or more of the drainage can be maintained in timbered cover distributed throughout the unit (Forest Plan III-65). It is unlikely that 40% or more of the drainage would provide well-distributed timbered cover within this timeframe because the regeneration within the burned area to the degree necessary to meet this requirement.

3.6 Watershed

Forest Plan goals include: 1) maintain or improve soil productivity and water quality (III-8); and 2) rehabilitate lands in declining and unsatisfactory watershed condition (III-9).

3.6.1 Watershed - Existing Conditions

Geology

Geologic basement material consists of the Pilgrim Formation (Csp), locally referred to as "the reef," along the southern boundary of the project area and the Gros Ventre formation (Cgf), moving in a northerly direction. These formations are overlain to the south by the Wapiti Formation (Twp) and underlain to the north by the Beartooth uplift (Ag). There are also localized deposits of Quaternary colluvium and morainal material (Qmm and Qcm) scattered throughout the project area.

The Pilgrim Formation is a massive limestone outcrop. The Gros Ventre Formation consists of interbedded micaceous shale, thin-bedded limestone, and limestone-pebble conglomerate. The Wapiti Formation is comprised of volcanic material, mostly breccias. The Beartooth uplift is granitic and meta-sedimentary material.

Project area physiography is primarily a result of glacial activity and post-glaciation colluvial slope development. Some reworking of material has occurred through stream action. Case (1994) identified one mass movement in the area. This feature, located in the western end of the project area, is a multi-slump deposit consisting of glacial morainal material and colluvium.

Field reconnaissance of this deposit validated the occurrence of small, localized scarp faces and pistil-butted conifers, primarily on slopes over 40 percent, indicating this deposit is actively moving in places or has the potential to become active if severely disturbed.

Soils

Forested areas. The forested portion of the project area is within ecological map unit 206 (Beta 27/PSEMEN-SYMALB ET and Helmville/PICENG-LINBOR ET Complex). Beta 27 is a loamy-skeletal, mixed, superactive Argic Cryoboroll. Helmville is a loamy-skeletal, mixed, superactive Typic Cryoboralf. Both soils have a thin organic horizon (one to two inches) that serves as an important sponge to protect the soil from erosion. They also have an argillic horizon, which can

serve as a slip plane for small, localized mass movements given certain moisture and surface disturbance conditions. Each soil contains a high percentage of calcium carbonate due to the limestone geology, and thus is subject to soil compaction, again given certain moisture and surface disturbance conditions. Steep slopes are a limiting factor throughout this map unit.

Wetland areas. Wetland portions of the project area are within ecological map unit 201 (Cryofluvents, Cryaquepts and Cryaquolls; Willow, Sedge, Moist Conifer and Moist Shrub Communities). Cryaquolls and Cryaquepts are the predominant soils. Vegetation is a mixture of willow, sedge, moist conifer, and moist shrub. The water table is either at the surface or very shallow depending upon locality. The Cryaquepts exhibit histic characteristics.

Rangeland areas. The rangeland portion of the project area is within ecological map unit 214 (Cheadale/ FEID-ELSM3, Starley/ARTRV-FEID and Rock Outcrop Complex). Both the Cheadale and Starley soils are loamy-skeletal, mixed, superactive Lithic Cryoborolls. Cheadale has a thicker mollic epipedon (7 to 15 inches), while the Starley is shallower (4 to 5 inches). Depth to bedrock is very shallow (10 to 20 inches).

Hydrology

The Wyoming Department of Environmental Quality classifies Reef Creek as 2AB. Class 2AB waters are those known to support, or have the potential to support, game fish populations, or spawning and nursery areas at least seasonally. They also are presumed to have sufficient water quality and quantity to support drinking water supplies and are thus protected for that use. Additionally, they are protected for non-game fisheries, fish consumption, aquatic life other than fish, primary contact recreation, wildlife, industry, agriculture, and scenic value uses.

Deadman and Camp Creeks are classified as 3B water. Class 3B waters are not known to support fish populations or drinking water supplies nor are such uses believed to be attainable. However, they do have sufficient hydrology to normally support and sustain communities of aquatic life including invertebrates, amphibians, or other flora and fauna at some stage of their life cycles. Uses designated include aquatic life other than fish, recreation, wildlife, industry, agriculture, and scenic value.

Fisheries

The Wyoming Game and Fish Department classifies the portion of Reef Creek within the project area and all of Deadman Creek as a Class 5 fishery (very low production water - often incapable of sustaining a trout fishery) because they have intermittent flow. Reef Creek, downstream of the project area near its confluence with the Clarks Fork River is a Class 3 fishery (important trout water - fishery of regional importance).

Camp Creek is classified as a Class 4 fishery (low production trout water - fishery frequently of local importance, but generally incapable of sustaining substantial fishing pressure) due to steep gradients and its effect on habitat suitability. The Clarks Fork River is classified as a Class 1 fishery (premium trout water - fishery of national importance).

Clean Water Act

Waters of the United States and floodplains within the project area are regulated by the Clean Water Act (particularly Section 404 and its associated regulations for implementation, which include mandatory BMPs), State of Wyoming Water Quality Rules and Regulations, Executive Orders 11988 and 11990, and Shoshone National Forest LRMP Management Area Direction 9A.

Watersheds of Concern

The project area is within two (C23B and C24B) validated watersheds of concern (SNF 1994a). Equivalent disturbed areas (EDA) are 21 and 28 percent respectively. The major contributor to

EDA (15 and 21 percent respectively) is wildfire (1988 Clover Mist). However, burn areas are located in the upper portions of these watersheds and not within proposed harvest units. Less than one percent of each watershed is in roads. Five and four percent (in EDA terms) of each watershed has been harvested in the past for timber. Any remaining amounts of EDA are other activities such as grazing and recreation use.

Stream Condition and Health

An ocular stream health assessment, using T-Walk (Ohlander 1996) as a guide, was conducted on Deadman Creek during October 2000. The assessment validated that this stream continues to show effects of the 1988 Clover Mist Fire. Due to the fire and associated loss of evapotranspirational surface, snowmelt and stream discharge quantity and timing have changed significantly. Troendle and Bevenger (1996) found that water yield in Jones Creek, a similar watershed within the Clover Mist burn area, increased significantly. The increase occurred on the rising limb of the hydrograph. Snowmelt began earlier than in Crow Creek, a similar unburned watershed. Stream flow in the burned area begins to rise sharply by the middle of March in most years, compared to mid-April for the unburned areas. No changes in peak, recession limb and base flows were observed. The water yield increase is of a large enough magnitude that stream channels within burn areas are adjusting, primarily by eroding laterally into bank material, resulting in unstable banks. As a result, fine sediment loading within and downstream of burn areas is higher than pre-fire conditions, resulting in a shift in the particle size distribution and lower than expected Tarzwell substrate ratios.

The stream health assessment also identified concerns with livestock grazing, particularly bank trampling and wet meadow impacts, along the portion of Deadman Creek that traverses Deadman Flat. These concerns are being addressed through allotment management planning. Assessment of past timber harvest activity indicates effects on stream condition and health are negligible or non-existent. A review of roads indicates much of the existing system is in acceptable condition but there are site-specific concerns with poor road location and poor road drainage.

3.6.2 Watershed – Enhancement Opportunities

There is an opportunity to correct existing road concerns. There is an opportunity to return targeted wetland and riparian areas to earlier seral stage.

3.6.3 Watershed Effects - Geology, Soils, Hydrology, and Aquatics

Post-treatment Condition of Aquatic System

The analysis of effects on watershed resources focuses on four general areas containing seventeen sub-areas:

- Aquatic Ecosystems (sediment, bed/bank stability, flow regimes, temperature/oxygen, water purity, aquatic life, TES species)
- Soil Productivity (soil erosion, soil compaction, nutrient removal, soil heating, regeneration hazard)
- Geologic Hazards (landslides, soil failures)
- Special Areas (riparian ecosystems, wetlands, floodplains)

The following disclosure of effects is by sub area. Each sub area contains a generic statement (italicized) of cause-effect relationships. Following the generic statements are detailed disclosures of *site-specific* effects by alternative.

Forest Plan management requirements for watershed protection and Wyoming Department of Environmental Quality Best Management Practices for Silviculture are very important components of the proposed action and alternatives to it. *The Plan requirements and BMPs discussed in this document have been monitored and proven effective on similar projects across the Forest. Documentation of BMP reviews on timber sales is located in Forest files and summarized in the Forest's Annual Monitoring Reports (1998 through 2001).*

Sediment

Most sediment delivered to streams comes from a source zone along streams whose width depends on topography, soils, and ground cover. Connected disturbed areas, like roads and other disturbed soils near streams, can deliver sediment during runoff events. Sediment deposits in streambeds can harm insect populations and fish reproduction.

None of the action alternatives carry a substantial risk of sediment delivery to streams from the acreage being silviculturally treated (i.e., that portion of harvest units outside of roads). This is due to the location of the harvest units, the minor amount of stream or wetland involved, or the types of silviculture and slash treatment being proposed.

Existing site-specific concerns with sediment delivery from roads would continue under Alternative I. These concerns would be resolved in the short-term under all three action alternatives because existing poorly located road would be moved to more suitable terrain and existing poorly drained road would be repaired. Alternative IV provides the best opportunity to resolve these concerns in the long-term because the road network would receive negligible use after the sale and thus have minimal need for maintenance. Alternatives II and III provide opportunity to resolve the concerns but not as effectively as Alternative IV because greater use of the roads would occur. Such use, between scheduled maintenance, could result in road damage that results in sediment delivery.

Proposed new road and log landing construction does not carry a substantial risk of new sediment delivery to streams because the design involves disconnecting these disturbances from streams and wetlands through the use of natural grade sags or constructed drainage that would divert sediment-laden runoff to buffer strips.

Bed/Bank Stability

Bed and bank stability can be damaged from trampling by animals or humans, vehicle impact, degraded bank vegetation, or excessive flow augmentations. Streams can be made wider and shallower, pools and overhanging banks can be destroyed, and much sediment can be added to streams.

Riparian areas along Deadman Creek would be harvested under all three action alternatives, so there is a risk to bed and bank stability if heavy machinery operates near the creek or if vegetation providing bank stability is removed. Timber sale contract language does not allow heavy machinery use near stream channels. Marking guidelines require that trees offering bank stability not be removed for harvest. Thus no negative effects on bed and bank stability are expected.

Alternatives II, III, and IV require reconstruction of a previous culverted crossing of Deadman Creek (FSR 144). Because a former template would be used and the crossing would be designed to minimize impacts to the channel, no substantial direct or indirect effects are expected.

Current impacts from the existing FSR 144 low water crossing (unarmored ford) through Deadman Creek would continue to be a concern under Alternative 1. Implementation of any of the action alternatives would resolve the concern because this crossing would be armored.

Flow Regimes

Flow regimes can be altered by major changes in cover type or ground cover, or dense road networks. Water temperature and chemistry, sediment transport, aquatic habitats, and aquatic life cycles can be degraded.

Alternative I would not affect flow regimes. Under the action alternatives, the amount of acreage being treated or disturbed hydrologically, is minimal. Therefore, water yield increases would be inconsequential and in reality would probably be utilized by remaining timber due to the type of silvicultural treatment and unit juxtaposition.

Additionally, under each action alternative, the transportation system would be disconnected from streams, thus reducing or eliminating stream network extension, which removes any chance for shortening storm response lag times.

Temperature/Oxygen

Summer water temperature is increased and winter water temperature is decreased by removing shade, reducing low flows, or damaging banks so streams are wider and shallower. Dissolved oxygen is usually reduced when summer water temperature is increased. Such impacts impair or destroy the suitability of water bodies for aquatic biota.

Alternative I would not affect temperature/oxygen. Under each action alternative a limited amount of shade would be removed but it would not affect water temperature to the point water quality regulation would be violated.

Water Purity

Placing concentrated pollutant sources near water bodies or applying harmful chemicals in or near water bodies can degrade water purity. Degraded water purity can impair or destroy use of the water by aquatic biota and humans.

Alternative I would not affect water purity. The effects of each action alternative on sediment water purity were discussed previously. Relative to chemical water purity, each action alternative carries some risk of water quality regulation violation because hazardous chemicals such as diesel fuel would be used. Contract language requires proper storage and management of such chemicals, and a contingency plan in the event a spill occurs. Therefore, effects of the action alternatives on chemical water purity are not expected.

Aquatic Life

Migration barriers, changed flow regimes, riparian damage, chemical loads, or big sediment loads can degrade aquatic life.

Under Alternative I aquatic life would continue to be impacted by sediment being delivered from roads. Under each action alternative, this concern would be corrected.

As previously discussed, the action alternatives would not affect bed and bank stability, flow regimes, temperature and oxygen, and water purity so negative impacts on aquatic life are not expected.

Aquatic Life Management Indicator Species (Fisheries) *Species can decline from sensitive to threatened to endangered to extinct. Predation, competition, harvest, or habitat damage may cause listing or loss of species.*

In the Forest Plan, game trout were selected as the Management Indicator Species for aquatic habitat. Yellowstone cutthroat trout are included on the Forest Service region 2 sensitive species list. Yellowstone cutthroat trout is the only aquatic sensitive species found within the diversity unit.

They are only found in the extreme lower reaches of Reef Creek, which is well outside the project area. None of the alternatives, including no action, affects Reef Creek (it is simply being used as a boundary line). Thus, there would be no effects on the aquatic sensitive species (Yellowstone cutthroat trout). The determination is that either of the proposed action alternatives may impact individuals but is not likely to cause a trend to federal listing or loss of viability of the Yellowstone cutthroat trout.

Soil Erosion

Severe erosion can impair long-term soil productivity if soils are heavily disturbed on shallow or highly erodible soils. Evidence of severe erosion includes rills or pedestals.

None of the action alternatives carries a substantial risk of erosion from the acreage being silviculturally treated (i.e., that portion of harvest units outside of roads). This is due to the types of silviculture and slash treatment being proposed.

Existing site-specific concerns with erosion of roads would continue under Alternative 1. These concerns would be resolved in the short-term under all three action alternatives because existing poorly located road would be moved to more suitable terrain and existing poorly drained road would be repaired. Alternative IV provides the best opportunity to resolve these concerns in the long-term because the road network would receive negligible use after the sale and thus have minimal need for maintenance. Alternatives II and III provide opportunity to resolve the concerns but not as effectively as Alternative IV because greater use of the roads would occur. Such use, between scheduled maintenance, could result in road damage that results in erosion.

Proposed new road and log landing construction does not carry a substantial risk of new erosion to streams because the design involves the use of natural grade sags or constructed drainage that would divert runoff before it has a chance to erode substantial amounts of soil.

Soil Compaction

Soil compaction is caused by excess weight of vehicles and animals. It impairs infiltration, root growth, and soil biota.

Regional guidelines for protecting the soil resource (Forest Service Handbook 2509.18-92-1) state that no more than 15% of an area will be left in a detrimentally compacted, displaced, puddle, severely burned, and/or eroded condition. This is obtainable through the project timing and the project design.

Alternative I would not have any effect on soil compaction. There is potential for compaction under each action alternative because soils in ecological map unit 206 have high clay and calcium carbonate content and soils in ecological map unit 201 are saturated (wetlands/riparian areas). Timber sale contract language would not allow harvest activities in map unit 206 when soil moisture is too high. Contract language would also specify harvest activities in map unit 201 must be conducted in the winter when the ground is frozen or there is sufficient snow depth. Thus, no negative effects from soil compaction are expected.

Nutrient Removal

Soil fertility depends on organic matter and nutrients. Soil productivity can be degraded if humus and topsoil, or even excess leaves and limbs, are taken offsite.

Alternative I would not affect nutrient removal. Under each action alternative, sufficient amounts of dead/down (>12 tons per acre) and activity fuels would be left on-site to ensure proper nutrient cycling. Non-merchantable trees and slash would remain on site unless specifically piled and burned for fuel reduction purposes. Bole removal results in only minor effects on nutrient removal.

Proposed pile and burn slash treatment is minor. Therefore, effects on nutrient removal are expected to be minor.

Soil Heating

Soil heating is caused by severe fires that occur when humus and large fuels are dry and large fuels are consumed near the ground. Soil heating sterilizes soil, alters soil physics, consumes organic matter, and removes much of the site's nutrients.

Alternative I would not result in soil heating unless catastrophic wildfire occurs in the future. Under each action alternative, a minor amount of pile and burn slash treatment would occur. Burn pile sites would result in soil heating that could affect site productivity for several years. These sites should recover in the long-term.

Regeneration

Forests must be restocked within five years after a harvest that creates a reforestation need. Regeneration may be impeded on marginal sites due to seedling mortality, plant competition, and other factors.

Alternative I does not present a regeneration hazard. Under the action alternatives, soil survey interpretations indicate regeneration potential in harvest units is fair to good. Field reviews in previously harvested areas in and near the project area indicate regeneration is not a concern. Therefore, the regeneration hazard is minimal to non-existent.

Landslides

Soil creep, debris avalanches and flows, slumps, and earthflows can occur on unstable slopes if roads overload or undercut them, vegetation is removed from them, or runoff is emptied onto them. Hazard depends on type of disturbance, nature of earth material, and water content.

Alternative I would not affect landslides. Under all three action alternatives there is a minor risk of triggering landslides because harvest units, and roads needed to access them, are located on landslide prone terrain. Timber harvest itself is not expected to cause landslides. Minor, localized slumping of road cuts are expected, but wholesale triggering of a large movement is not.

Soil Failures

Soil failures include land subsidence, shrinking-swelling soils, and collapsing soils. Removal of subsurface fluids or materials, or changed hydrology of certain soil types, can induce soil failures.

Alternative I would not result in soil failures. As discussed previously, Alternatives II, III, and IV are not expected to result in unacceptable levels of soil compaction thus soil failures are not expected either.

Special Areas

Riparian Ecosystems

Riparian ecosystems provide shade, bank stability, fish cover, and woody debris to aquatic ecosystems. They also provide key wildlife habitat, migration corridors, sediment storage and release, and surface-ground water interactions. Composition and structure of riparian vegetation can be changed by actions that remove certain species and age classes.

Alternative I would not affect riparian areas, other than natural processes would continue. Harvest in riparian areas would occur under each action alternative. This harvest would occur while the ground is frozen or covered with snow, thus no effects from working in the riparian areas with harvest equipment are expected.

Wetlands

Wetlands control runoff and water quality, recharge ground water, and provide special habitats. Actions that may alter their ground cover, soil structure, water budgets, drainage patterns, and long-term plant composition can impair these values.

Under Alternative I, vegetation succession would continue, which means wetland areas would continue to dry out as evapotranspiration increases due to increases in biomass.

Harvest in wetlands would occur under each action alternative. This harvest would occur while the ground is frozen or covered with snow, thus no effects from working in the wetlands with harvest equipment are expected.

Each action alternative results in removal of biomass from the wetlands, which would prevent them from drying out. Alternative II would result in the most biomass reduction. Alternative III would result in the least biomass reduction.

Floodplains

Floodplains are natural escape areas for floods that temper flood stages and velocities.

Alternative I would have no effect on floodplains. Under each action alternative, timber harvest activity would occur within a portion of the Deadman Creek floodplain. Timber sale contract language strictly controls tree removal within this zone. Thus, no effects on floodplains are expected.

Under Alternatives II, III, and IV a previous culverted crossing of Deadman Creek would be reconstructed. This crossing would be designed to be stable under the 100-year flood, thus no effects on floodplains at this location would occur.

Under Alternative I existing concerns with the unarmored ford of Deadman Creek would continue. This concern would be corrected under each action alternative because the ford would be reshaped to approximate the original channel and then armored.

3.7 Transportation System

The emphasis of forest transportation planning is managing access within the capability of the land. The focus of road management is maintaining needed roads and decommissioning unneeded roads. The objective is to have the minimum system of roads needed to administer and protect National Forest System lands using a science-based transportation analysis and recognizing likely, realistic funding estimates (36 CFR 212). To assist in the understanding of this section, the following definitions are included.

Definitions

- *National Forest System Road* (FSR) (formerly a Forest Development Road (FDR)) is a classified road (motor vehicle travelway that is managed for motor vehicle access) that is in a national forest transportation network and under Forest Service jurisdiction that is all or partially within or adjacent to National Forest System lands; and is needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands (36 CFR 212.1).
- *Temporary road* is an unclassified road associated with short-term access needs that is unnecessary for future resource management, and is not intended to be a part of the forest transportation system (36 CFR 212.1).

Closed road is a road on which motorized use is restricted for public safety or resource protection purposes (generally by signing and a control structure such as a gate) either yearlong or seasonally (36 CFR 212.5 (a)(2)(ii)). Closed roads may be used for and to accomplish administrative purposes when prescribed in the Forest Plan, when authorized by the Forest Supervisor, or in case of emergency (III-89). Closed roads include those roads for which motorized use of the road for both public and administrative access is not required for management purposes in the short term, but where a road will be needed for future management (i.e., reentry for vegetation or timber management). In this situation, the road would be restored to a more natural state, but the road prism (the slopes and driving surface of the road) would be left in place such that there can be future use of the road when necessary. Reconstruction of the road (approximately 20 to 25% of the initial capital investment cost) would be required before the road is usable for future motorized use. All closed roads are maintained to a specified standard.

- *Road decommissioning* (previously termed obliteration) is the act of restoring a road to a more natural state through activities such as reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation when it has been determined that the road is not needed to meet forest resource management objectives (36 CFR 212.5). The intent is to remove motorized use from a road, and to remove the road (obliterate) when necessary by eliminating the functional characteristics of the road and reestablishing the natural resource production capability. The road prism (slopes and driving surface of the road) may be removed, slopes may be recontoured, and most all road capital investment is lost as there is no intent to reenter the area in the future. Total construction of a new road would be necessary to allow future motorized use.

3.7.1 Forest Plan Direction Relating to Roads

Forest Plan direction provides that all newly constructed roads be closed to public motorized use (public use will be restricted yearlong) (III-88), and that existing roads remain open to motorized use (III-89), unless another course of action is justified by documented analysis for reasons stated in the Plan. This direction is subject to considerations that include public safety, public need, and resource protection needs. The Record of Decision for the Plan EIS specifies (page 17): "most local roads constructed for timber harvest will be closed to public use," and the analysis of effects in the Plan EIS is based on the assumption that new timber roads will be closed.

The Forest Plan ASQ amendment (1994), stipulates that there will be "no net increase in roads." This stipulation clarifies and provides more specific guidance supplementing direction that is already present in the Plan. "No net increase in roads" is not a prohibition on new roads. It will not affect the construction of roads for short-term uses, such as temporary timber sale roads, which under current direction would be decommissioned anyway. If new roads are constructed and left open to public motorized use however, another road would need to be removed from the system (the assumption and the intent relates to roads in the immediate vicinity when feasible) in accordance with the priorities and guides given in the amendment. *It is essential to note that the no net increase in roads is a forestwide standard, whereas within a five-year period, the number of miles of new National Forest System Roads cannot exceed the number of miles of roads decommissioned forestwide (Forest Plan III-75). Road decommissioning priorities in the amendment do encourage that decommissioning occur in the same 4th order watershed whenever possible, but it is not mandatory.*

Forest Plan direction III-89 4.g. directs that open roads remain open unless use conflicts with wildlife management objectives. Although road density standards are not directly stated in the Forest Plan, direction on III-49 3.a. requires that habitat for each species will be maintained at 40% or more of potential. As stated in the wildlife section, evaluation of habitat must consider both habitat value and habitat effectiveness.

If vehicle traffic displaces species such as big game and large carnivores from a distance of ¼ mile (based upon documented studies with elk), two miles of open road per square mile can compromise habitat effectiveness to less than 40%. In order to maintain 40% habitat effectiveness (100% being potential), a timbered area could have no more than 1.2 to 2 miles of open road per square mile of area depending on habitat variables. A road density analysis was completed for this proposal, and the effects of roads, and habitat effectiveness values are described in the Environmental Consequences Section. See the Wildlife Section for discussion on habitat effectiveness.

The Forest Plan also calls for seasonal road restrictions when conditions warrant (III-89, 3.a-f). Seasonal restrictions are warranted when unsafe conditions result due to weather, when use causes unacceptable damage on roads during certain seasons (i.e., soil erosion during snowmelt), or when unacceptable resource conflicts occur due to motorized access (i.e., conflicts with birthing elk).

3.7.2 Existing Road System

Access to the project area is gained by using Wyoming State Highway 296 (Chief Joseph Scenic Highway), Forest Service Road 114 (Camp Creek Road), FSR 144 (Deadman Bench Road), and an existing, unnumbered spur road (*see* Figure 17). WY 296 is an all-weather, paved, two-lane highway that traverses the northern part of the study area. The existing alignment of the Camp Creek Road, and the Deadman Bench Road join with WY 296 near the eastern end of the proposed project area. *This area has the highest road density on the Forest within the grizzly bear recovery zone. The Deadman Bench has approximately three miles of road per square mile.*

The Camp Creek Road and the Reef Creek Road (FSR 115) are single-lane, native-surfaced, graded roads for much of their length, and are in good condition. The primary administrative use of these roads has been for timber sale access and reforestation purposes. A locked gate restricts public access seasonally on the Camp Creek Road and the Reef Creek Road (December 15 to July 15 for soil, water, and wildlife protection purposes).

Deadman Bench Road is a single-lane, non-surfaced road that was used historically for access for silvicultural treatment and access to the utility line, which it closely follows. It is an unimproved two-track which bisects the Deadman Bench Meadow for most of its length.

The east end of the Deadman Bench Road near its junction with WY 296 is a steep section (16 to 20%) that is actively eroding, deeply rutted, and is nearly impassable unless dry conditions exist. Even in a dry state, the first 0.42-mile section of the Deadman Bench Road is too steep to be used as an acceptable access by large trucks (from a resource protection perspective), and hazardous from a safety perspective due to the limited site distances for entering the highway.

The existing spur road proposed for use to access the project area, and to replace the existing eastern 0.42-mile portion of the Deadman Bench Road stems off the Camp Creek Road (FSR 114) approximately 0.9 miles from its intersection with the Chief Joseph Scenic Byway (WY 296). This road has not been in use for at least fifteen years, judging by the amount of existing vegetation in the roadbed. For resource protection purposes, and from a long-term need and maintenance perspective, this alignment appears to be the best location for accessing the Deadman Bench. On this previously used 0.49-mile road, drainage structures have been removed, and barriers (tank-traps) physically obstruct motorized access for the first few hundred feet. This road crosses Deadman Creek and accesses the flat timbered area above the wetland just several hundred yards from the open meadow where the Deadman Bench Road is located.

The proposed temporary roads intersecting the Reef Creek Road above the reef are located on shallow soils. Improvement and use of these roads would be limited to the degree necessary for removal of forest products associated with this project. Based on the revegetation of other

temporary and closed roads used for similar purposes in the area (such as described above), the temporary road would adequately revegetate.

3.7.3 Roads – Enhancement Opportunities

Many opportunities exist within this proposal for moving from the existing conditions toward more desirable conditions stated in the Forest Plan relative to access management. Opportunities relate to management of motorized access, and opportunities associated with enhancement of soil/water conditions using seasonal or yearlong access restrictions and road decommissioning.

Several other possible alignments to access Deadman Bench were considered, but after field reconnaissance were determined not to be feasible. The two options were to connect the Camp Creek Road (FSR 114) to the Deadman Bench Road (FSR 144) starting from the lower switchbacks on the Camp Creek Road and contouring around to the Deadman Bench. The options were: a) to cut through the rock reef below the bench with a large cut and fill, in full view of the scenic byway, which was deemed unacceptable, or b) to parallel and cross a deeply incised creek above the lower rock reef. In addition to resource concerns, both options basically just replaced the lower substandard section of the Deadman Bench Road, and did little to access vegetation proposed for treatment, and more roads would be required to complete the proposed treatment.

3.7.4 Effects on the Transportation System and Access

Roads and Access	Alternative I	Alternative II	Alternative III	Alternative IV
Open roads (Standard is no net increase)	No change	minus 3.86 mi yearlong	minus 3.86 mi seasonally	minus 11.28 mi yearlong
Roads - new construction	0	0.69 miles	0.69 miles	0.69 miles
Roads reconstructed	0	0.49 miles	0.49 miles	0.49 miles
Roads decommissioned	0	0.78 miles	0.78 miles	0.78 miles
Unclassified roads decommissioned	0	0.32 miles	0.32 miles	0.32 miles
Additional access restrictions				
Yearlong closure to public	0	3.86 mi	0	11.28 mi
Seasonal closure to public	0	0	3.86 mi	0
Net change in amount of roads	*No change*	*Net decrease of 0 .41 mile*	*Net decrease of 0 .41 mile*	*Net decrease of 0 .41 mile*

Figure 16. *Each alternative would lead to different effects on the transportation system in the Deadman Bench area.*

Alternative I

Implementation of Alternative I would allow the existing road on Deadman Bench (FSR 144) to remain open for public access, administration, and power line maintenance on a yearlong basis. The Camp Creek Road (FSR 114) and Reef Creek Road (FSR 115) would remain open seasonally from July15 to December 15.

As a result, public motorized access would continue to be available, and the steep 0.42-mile section coming off the highway would continue to erode causing additional deterioration of the road. Continued use of this road would maintain and possibly lower (due to decreased canopy) the level of habitat effectiveness that presently exists in the Deadman Bench area during the period when the road is usable by motorized vehicles (July 15 to December 15). No change from the existing situation exists under the no action alternative, so no effects would result to hunters, recreationists and other motorized public users of the project area.

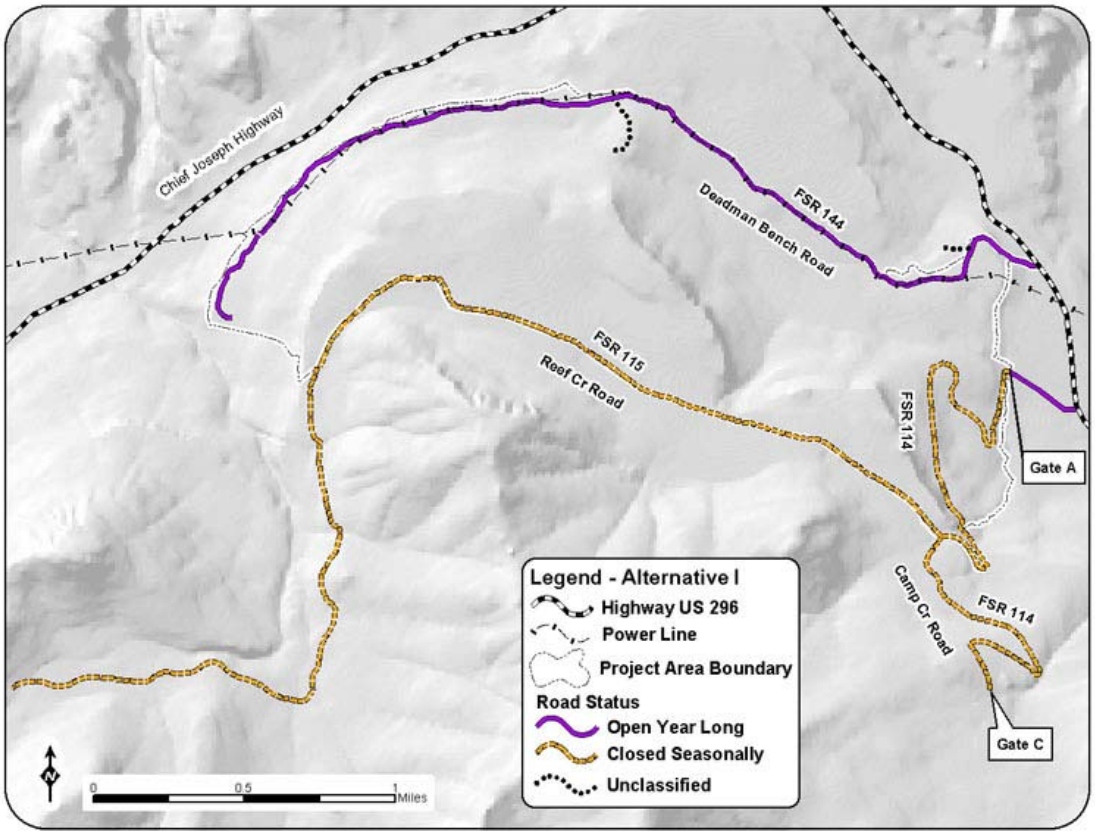


Figure 17. *Implementation of Alternative I would allow the existing road on Deadman Bench (FSR 144) to remain open for public access, administration, and power line maintenance on a year long basis. The Camp Creek Road (FSR 114) and Reef Creek Road (FSR 115) would remain open seasonally from July 15 to December 15.*

Alternative II

Under Alternative II, the first 0.42 miles of the Deadman Bench Road coming off the Chief Joseph Highway would be decommissioned upon initiation of treatment; 0.36 miles of classified road past the power line and 0.32 miles of unclassified road would be decommissioned during treatment. Public motorized access would be restricted permanently on the realigned Deadman Bench Road starting at the old clear cut that leaves FSR 114 and links into FSR 144. Administrative use (for fire and power line maintenance purposes) would still be allowed. The Camp Creek Road (FSR 114) and Reef Creek Road (FSR 115) would remain open seasonally from July 15 to December 15.

The effects of implementing this transportation management option are the elimination of public motorized access opportunities on the Deadman Bench yearlong, *a 3.86 mile decrease in the amount of roads open to the public, a net decrease of 0.41 miles of total road because of decommissioning,* an increase in habitat effectiveness values on the Deadman Bench, and the elimination of erosion on the initial segment of the existing Deadman Bench road.

This permanent gating/restriction of 3.86 miles of the Deadman Bench Road is for resource protection purposes. In addition to providing a significantly improved administrative access to Deadman Bench, the new constructed/reconstructed portion of the alignment of FSR 144 would provide excellent access to treatment units, providing skid distances of less than 1,500 feet.

Changes from the current access management exist under alternative II. The effects that would result to hunters, recreationists and other motorized public users of the project area are that a total of 3.86 miles of additional yearlong road closure would be implemented for resource protection and motorized use of the Deadman Bench would be foregone. Additional non-motorized opportunities would be available yearlong.

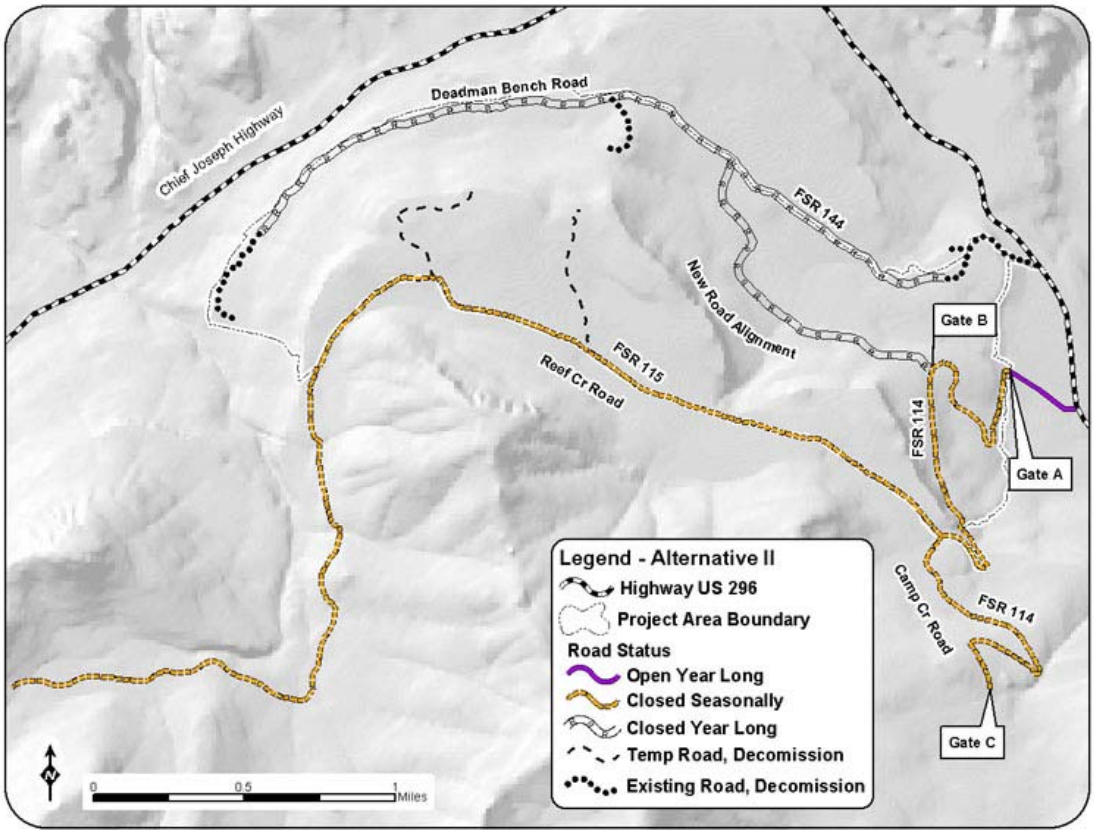


Figure 18. *Under Alternative II, the first 0.42 miles of FSR 144 would be decommissioned upon initiation of treatment. Public motorized access would be permanently restricted on the realigned portion that leaves FSR 114 and links into FSR 144. Administrative use would still be allowed. FSRs 114 and 115 would remain open seasonally from July 15 to December 15.*

Alternative III

Under Alternative III, the first 0.42 miles of Deadman Bench Road (FSR 144) coming off the highway and the last 0.36 miles of road past the power line would be decommissioned. Public motorized access to the Deadman Bench Road would be restricted during the treatment period, and upon completion of the treatment public motorized access would be restricted seasonally (same as Camp Creek Road and Reef Creek Road) on the realigned access road starting at the old clear cut and linking into FSR 144.

Changes from the current access management exist under alternative III. The effects that would result to hunters, recreationists and other motorized public users of the project area are that a total of 3.86 miles of seasonal road closure would be implemented for resource protection. The Camp Creek Road, Reef Creek Road, and the Deadman Road would remain open seasonally from July 15 to December 15. *There would be a net decrease of 0.41 miles of total road.*

The effects of implementing this transportation management option are that public motorized access opportunities on the Deadman Bench would be maintained during summer and fall.

Habitat effectiveness values would decrease below existing values due to the enhanced access and the fact that the new alignment bisects a portion of the presently secure area on the Deadman Bench. Erosion on the initial segment of the existing Deadman Bench road would be curtailed due to the road relocation. Additional non-motorized opportunities would be available seasonally, outside the open road period of July 15 to December 15.

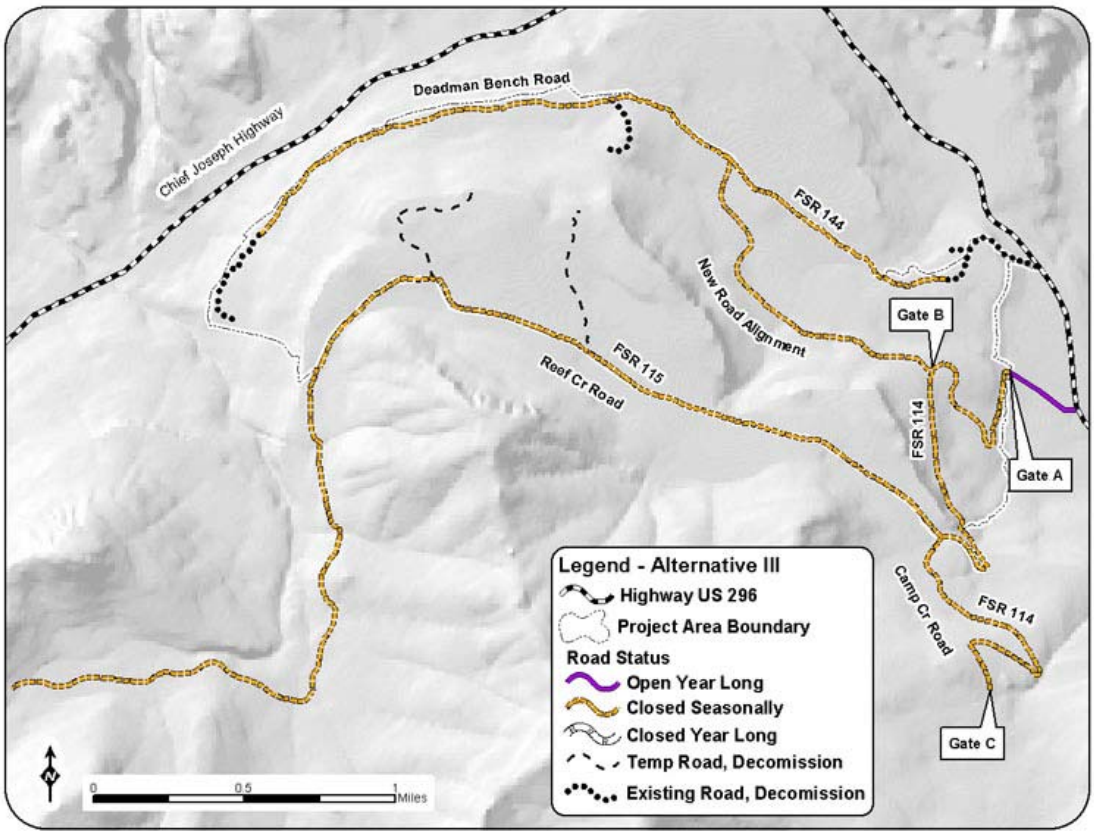


Figure 19. *Under Alternative III the first 0.42 miles of FSR 144 coming off the highway would be decommissioned. Public motorized access to FSR 144 would be restricted during the treatment period; upon project completion, public motorized access would be restricted seasonally on the realigned access road starting at the old clear cut and linking into FSR 144. FSRs 114, 115, and 144 would remain open seasonally from July 15 to December 15.*

Alternative IV

Under Alternative IV, the first 0.42 miles of Deadman Bench Road coming off the highway and the last 0.36 miles of road past the power line would be decommissioned, and public motorized access to the Camp Creek Road, Reef Creek Road, and the Deadman Bench Road would be permanently restricted starting at project initiation. The Camp Creek Road, Reef Creek Road, and the Deadman Road would remain available for administrative use only (i.e., fire suppression and power line maintenance).

The result of implementing this transportation management option are that there would be no public motorized access opportunities any time of the year on the Deadman Bench, in Camp Creek, or in

Reef Creek. The total miles of roads closed yearlong would be 11.28 miles. The effects that would result to hunters, recreationists and other motorized public users of the project area are that a total of 11.28 miles of yearlong road closure would be implemented for resource protection. The Camp Creek Road, Reef Creek Road, and the Deadman Road would remain closed yearlong. Additional non-motorized access would be available yearlong over a much larger area than with the other alternatives. *There would be a net decrease of 0.41 mile of total road.*

Habitat effectiveness values related to vehicle intrusions would be enhanced to the highest level possible on the Deadman Bench as well as in Reef Creek and Camp Creek. Erosion resulting from management activities would be curtailed in the long-term as there would be only administrative motorized use on the Deadman Bench, in Camp Creek, and in Reef Creek.

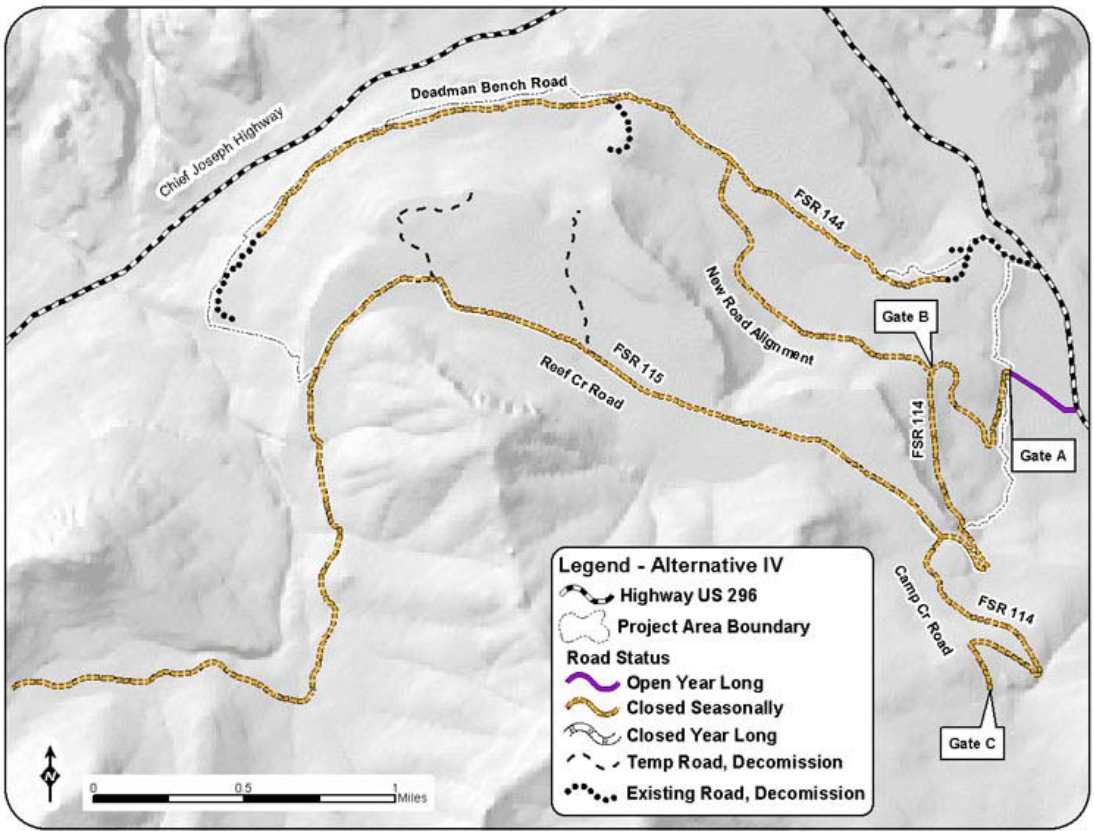


Figure 20. *Under Alternative IV the first 0.42 miles of FSR 144 coming off the highway would be decommissioned upon initiation of the project, and public motorized access to FSRs 114, 115, and 14 would be permanently restricted. These roads would remain available for administrative use only.*

3.8 Heritage Resources

3.8.1 Existing Condition

This section presents the existing conditions for Heritage Resources within the diversity unit, considering past and present activities. Past and present activities such as livestock grazing, dispersed recreation, and a low density of roads and trails have occurred in portions of the project area. A Class III survey for cultural resources in the project area was completed. This field

inventory resulted in one cultural resource site being located. It was determined not to be adversely affected by the project as planned.

The Wyoming Department of State Parks and Cultural Resources State Historic Preservation Office (SHPO) reviewed the cultural resource survey. SHPO concurred with the Forest Service determination that no historic properties would be affected by this project. They recommended that the US Forest Service be allowed to proceed in accordance with state and federal laws subject to this stipulation. The concurrence letter is located in the project file.

If cultural materials were discovered during construction, work in the area should halt immediately and the USFS staff archaeologist and SHPO staff must be contacted. Work would not resume until the materials have been evaluated and adequate measures for their protection have been taken.

3.8.2 Effects on Heritage Resources

No direct effects would result from implementation of any alternative. New sites discovered during the course of project implementation would be protected from ground disturbance while on-site evaluations of their significance and treatment are made in consultation with the SHPO.

3.9 Plants

No threatened, endangered, or proposed plant species are known or likely to occur within the project area.

3.9.1 Sensitive Plants

Seventeen plant species that have been designated regionally sensitive are known or suspected to occur on the Forest. A review of the habitat requirements of those species in relation to the habitats that would likely be significantly affected by timber harvest activities was made as a part of the 1994 ASQ analysis. It was concluded that no impact would result from timber harvest activities on most of these species because they are not generally found in areas where timber harvest activities would occur.

Sensitive species that could possibly occur in the project area are pink agoseris *(Agoseris lackschweitzii),* round-leaved orchid *(Amerochis rotundifolia),* red manzanita *(Arctostaphylos rubra),* livid sedge *(Carex livida),* marsh muhly *(Muhlenbergia glomerata),* Greenland primrose *(Primula egalikenis),* myrtleleaf willow *(Salix myrtillifolia var. myrtillifolia),* rolland bulrush *(Scirpus rollandii),* and Hall's fescue (*Festuca halli).*

The habitat of these species (excluding Hall's fescue) includes moist, shady spruce forest or wetland areas. Since north facing, late seral forest areas comprise approximately one half of the project area, favorable conditions for several designated sensitive plant species may exist. Also, the wetland area is comparable to forested areas adjacent to the nearby Swamp Lake (which has several sensitive species) and favorable habitat may occur near or within the wetland area.

Species Name	Vegetation Type	Soil Type	Habitat Present in Project Area	Project Area Method of Survey	Species Present in Project Area	Notes
Pink agoseris (*Agoseris lackschweitzii*)	Wet Montane/subalpine meadows	Variable	Yes	Literature cited/Field Survey	No	Meadows
Round-leaved orchid (*Amerorchis rotundifolia*)	Coniferous bogs	Calcareous	Yes	Literature cited/Field Survey	No	Swamp Lake area primary occurrence
Red manzanita (*Arctostaphylos rubra*)	Coniferous bogs	Calcareous	Yes	Literature cited/Field Survey	No	Swamp lake area primary occurrence
Upward-lobe moonwort (*Botrychium ascendens*)	Wet meadows/willow	Alluvium	No	Literature cited	No	Willow riparian
Livid sedge (*Carex livida*)	Floating mats, bogs, fens	Calcareous	Yes	Literature cited/Field Survey	No	
Wyoming tansymustard (*Descurainia torulosa*)	Rocky slopes and ridges	Volcanic	No	Literature cited	No	Endemic to Absaroka Mountain Range
Kirkpatrick's ipomopsis (*Ipomopsis spicata spp. robruthii*)	Alpine scree	Volcanic	No	Literature cited	No	Alpine
Fremont bladderpod (*Lesquerella fremontii*)	Barren slopes and ridges	Calcareous	No	Literature cited	No	Meadows
Hall's fescue (*Festuca hallii*)	Montane grassland	Calcareous	Yes	Literature cited/Field Survey	No	
Marsh muhly (*Muhlenbergia glomerata*)	Bogs, floating mats, fens	Calcareous	Yes	Literature cited/Field Survey	No	Swamp Lake area primary occurrence
Naked-stemmed parrya *(Parrya nudicaulis*)	Alpine	Calcareous	No	Literature cited	No	
Greenland primrose (*Primula egalikensis*)	Bogs, fens	Calcareous	Yes	Literature cited/Field Survey	No	Swamp Lake area primary occurrence
Absaroka goldenweed (*Pyrrocoma carthamoides var. subsquarrosa*)	Montane meadows, grasslands	Calcareous	No	Literature cited	No	
Myrtleleaf willow (*Salix myrtillifolia var. myrtillifolia*)	Floating mats, bogs, fens	Calcareous	Yes	Literature cited/Field Survey	No	Swamp Lake area primary occurrence
Rolland bulrush (*Scirpus rollandii*)	Floating mats, bogs, fens	Calcareous	Yes	Literature cited/Field Survey	No	Swamp Lake area primary occurrence
Shoshonea (*Shoshonea pulvinata*)	Calcareous soils & rock outcrops	Calcareous	No	Literature cited	No	
North Fork easter daisy (*Townsendia condensate var. anomala*)	Rocky slopes and ridges	Volcanic	No	Literature cited	No	Endemic to Absaroka Mountain Range

Figure 21. *Sensitive plants on the Shoshone National Forest. Shading designates the species with habitat present in the project area.*

Effects of Alternative I on Sensitive Plants

This alternative would not change the existing condition. The no action alternative would mean that no beneficial or adverse effects would occur to sensitive plants because of project activities.

Effects of the Action Alternatives on Sensitive Plants

A review of the habitat requirements of those species in relation to the habitats that would be affected by project activities was made and is displayed in Figure 21. It was concluded that no impact would result from activities on these species because none were found during the field survey completed of the project area, including an in-depth survey of the wetland.

Because field survey failed to document the presence of any sensitive species, in conjunction with the ASQ analysis results indicating little risk to these species from timber harvest activities, the following determination was made: The no action alternative and the action alternatives may impact individuals but are not likely to cause a trend to federal listing or loss of viability of sensitive plants.

3.9.2 Noxious Weeds

Infestation and spread of noxious weeds are associated with surface disturbing activities such as timber harvest and road building, and to a lesser extent off-highway vehicle use, livestock grazing, prescribed burning, wildfire, and recreation use. Niches for weeds will be opened up if mineral soil is exposed and competition from established plants is temporarily reduced. Since seed sources occur within the diversity unit, new infestations are possible. Known infestations of noxious weeds are monitored and treated as needed.

A draft 2000 USFS Region 1 weed risk assessment rating was used to address potential spread, consequences, and adverse effects, and overall the project area has a moderate rating. Canada thistle and oxeye daisy are the primary noxious weed species found in the diversity unit and need to be treated before project implementation.

Effects of Alternative I on Noxious Weeds

This alternative would not change the existing condition. The no action alternative would mean that no beneficial or adverse effects would occur to weeds because of project activities. Spread of noxious weeds is likely to continue at a relatively slow rate. Weed seed would continue to be spread by hikers, horseback riders, livestock, wildlife, vehicles, and wind. The Forest Service would continue treating known populations of noxious weeds.

Effects of the Action Alternatives on Noxious Weeds

For the action alternatives, a slight increase and spread in weeds would occur due to potential ground disturbance from vehicles and the removal of vegetation from mechanical treatments. Niches for weeds would be opened up where mineral soil is exposed and competition from established plants is temporarily reduced. Since seed sources occur within the diversity unit, new infestations are a possibility. Existing populations, such as Canada thistle and oxeye daisy, are the most likely to increase slightly. Monitoring of the project area would occur with follow-up weed treatment implemented as needed. Treatments would be in accordance with the existing noxious weed EA for the Shoshone National Forest.

3.10 Social and Economic Environment

The social setting, which includes the area potentially affected by this proposal, is described in the FEIS for Allowable Sale Quantity, pages III-12 through III-18. The economic setting is described in that document on pages III-2 through III-11. These pages are hereby incorporated.

- Ranching and related agriculture, oil and gas, timber products, tourism and dispersed recreation such as hunting and outfitting are a major component in the socio-economics of Park County.
- As summarized by the Park County Commissioners in a June 5, 2002 letter, timber products are important to the economic welfare of Park County. Revenue to the County from 25% of mineral resources continues to decline. In addition to county budget concerns, we want to maintain a healthy local economy, which is enhanced by the sale of National Forest timber. The local sawmill, Cody Lumber, Inc., employs 60 people with an annual payroll of over $1 million dollars. When the multiplier effect is considered, this industry contributes significantly to the local economy.
- Over the past 90+ years, livestock grazing has occurred within the diversity unit.

3.10.1 Environmental Justice

Presidential Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was issued in February 1994. This directed federal agencies to consider, as part of the NEPA analysis process, how their proposed actions or projects might affect human health and environmental conditions on minority and/or low-income communities.

Two fundamental questions are posed by the CEQ (Council of Environmental Quality) to help agencies address these and related factors: 1) "Does the potentially affected community include minority and/or low-income populations?" and, 2) "Are the environmental impacts likely to fall disproportionately on minority and/or low-income members of the community and/or tribal resources?"

In answering the first question we used 1990 census data to examine the minority and low-income populations in Park County, the county where the proposed action occurs. The minority populations for Park County represent less then 2.5% of the total population for the county. This compares to 5.8% minority populations for the whole of Wyoming. CEQ guidance identifies a minority population as one where either: a) the minority population of the affected area exceeds 50 percent or b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population. For this analysis the affected area is identified as Park County and the state of Wyoming is used as the geographic reference for the general population. Park County meets neither of the above conditions, so there are no minority populations identified.

The percentage of persons below the poverty level for Park County is 9.5 percent as compared to 11.9 percent for Wyoming. Those persons are generally dispersed throughout Park County and there are no specific communities that are predominately low income. For this analysis no low-income populations where identified. Given that no minority or low-income populations are identified in the affected area there is no disproportionate effect from any alternative on such populations regarding environmental justice concerns or factors.

3.10.2 Effects on the Social and Economic Environments

The economic and social environments and potential impacts of timber harvest on them are thoroughly described in the ASQ EIS. This discussion of economic and social effects is tiered to the Allowable Sale Quantity Environmental Impact Statement. That analysis is hereby incorporated (ASQ EIS III-2 to 18, and IV-2 to 10).

This project is such that there would be a beneficial effect to Park County, Wyoming. Possible benefits in the social or economic environment would include positive effects from revenue to the

county, jobs and dollars spent locally. The economic importance of such projects was described in the June 5th letter from the Park County Commissioners' office.

Without individual projects such as this on a continued and dependable basis, a viable commercial wood products industry would not be maintained. Maintenance of a viable industry is essential to public land management because they provide the mechanism (tool) for implementing silvicultural treatments that are necessary to achieve ecosystem and resource sustainability.

The social effect of access management was described in Section 3.7.4 of this document. Social and economic concerns relative to the project are symptomatic of general trends occurring in much of the western United States. For example, issues revolving around access, private lands and ownership rights, regulation, resource impacts, multiple use, growth and development, economic dependency, county and local jurisdiction, etc, could enter the discussion. However, resolution of all issues is beyond the scope of the analysis for a single timber sale. Locally, feelings are likely to run high on both sides of any issue about this project.

Economic Efficiency Analysis

Figure 22 summarizes the results of the financial analysis conducted by alternative for the proposed silvicultural treatments. Benefits are based on the volume of timber sold. Quantifying resources that are not typically valued in terms of dollars can be misleading due to the difficulty in assigning monetary value to resources such as wildlife, vegetation diversity, scenic quality, watershed condition, and recreation opportunities. For this reason these resource values were not quantified in terms of dollar values and were not included in the economic efficiency analysis. Consequently, the analysis of revenues and actual project costs offers only a partial guide to the decision process.

	Alt. I	Alt. II	Alt. III	Alt. IV
Present Value (discounted) benefits	$00,000.00	$1,037, 297.00	$948,067.16	$1,132,103.72
Present Value (discounted) costs	$00,000.00	$-444,780.22	$-394,946.64	$-466,426.70
Net Present Value	$00,000.00	$592,516.79	$553,120.52	$665,677.02
B/C Ratio	0.00	2.33	2.40	2.43

Figure 22. *Financial analysis by alternative.*[1]

All costs are deemed necessary and appropriate to move the vegetation in the diversity unit towards the desired condition using silvicultural treatments while taking into consideration necessary design criteria and mitigation. This analysis was conducted using Quicksilver economic analysis software. Revenue from timber was calculated using the regional average figure in the Quicksilver program, which is $209.00/MBF.

3.11 Cumulative Effects Analysis

Cumulative effects are changes to the environment, both beneficial or detrimental, that result from the incremental change caused by an action when added to other past, present and reasonably foreseeable actions regardless of what agency or person undertakes such actions (40 CFR 1508.7). The procedure used for cumulative effects analysis is consistent with Council On Environmental Quality guidance (Considering Cumulative Effects, CEQ, January 1997). For each resource of concern, considering the area subject to cumulative effects and the applicable sources of change, the total effect of these sources plus the effect of the action alternatives are evaluated. In those instances when there is appreciable difference between the action alternatives and the no action

[1] Net present value = the difference between the discounted value of all outputs to which market prices are assigned and the total discounted costs. B/C ratio = discounted values divided by the discounted cost.

alternative, or there are measurable differences between action alternatives, the effects will be discussed by alternative. The total effect is described in relative terms of intensity (e.g. negligible, immeasurable, small, moderate, major, extensive); differences between alternatives are discussed using comparative descriptors (e.g., more than, less than, etc.).

This disclosure of cumulative effects is tiered to the effects analysis presented in the Oil and Gas EIS, Chapter IV (99 to 101, 103, and 108), Appendix D (especially pages D-1 to 5, and D-25 to 32). It is also tiered to the analysis in the ASQ EIS, particularly pages III-49, 50, 56, and IV-28 and 32. These analyses describe this area as an area of concern for cumulative effects on soil and water as well as wildlife.

The assumptions used in identifying possible cumulative effects are:

- The existing Forest Plan direction will continue to be followed for the next 30-year period. Management requirements and design standards for prescribed management activities will be followed and implemented for all activities.
- No catastrophic disturbances from stand replacing wildfires will occur during the next 30 years.
- Treatment of the suited timber base lands will occur based on stand conditions and need. Current ASQ outputs will be met. Priority for treatment will be based on culmination of mean annual increment, and risk of loss of merchantable timber from insect infestation, disease, and wildfire. All suited based lands in the diversity unit at high risk will be treated in the next 30 years.
- Forested landscapes will be managed to maintain land health. A healthy landscape would be a diverse landscape containing a variety of vegetation types, age classes, and stand structure in a pattern that has differing components positioned and distributed to sustain healthy conditions.
- There will be no pre-commercial thinning within next 30 years based on economic efficiency and lynx habitat constraints. Commercial thinning of lodgepole pine will occur in the existing clear cut located in the project area.
- Scenic Byway vegetation enhancement projects relating to aspen regeneration will occur.
- Personal use firewood and Christmas tree cutting will continue.
- No additional power lines or utility corridors will be installed.
- Additional development of private lands within the diversity unit will not occur.
- Additional development (resorts, campground, trails) on Forest Service land will not occur.
- Grazing will continue at existing levels.
- Big game hunting and other recreation activities will continue at existing levels.

3.11.1 The Spatial and Temporal Bounds of Cumulative Effects

Cumulative effects are a function of the types of effects in relation to resources of concern, the duration of effects and the distances that effects can travel. Because of this, the geographic area of concern can be different for different resources. This is explained and documented in the Oil and Gas EIS, pages IV-97 to 98, and Appendix D. The 15,767-acre diversity unit is being used as a spatial boundary for this analysis unless otherwise noted. The timeframe relative to past activities is from 1965 to present. Reasonable foreseeable sources of impact are based upon a 30-year projection into the future.

3.11.2 Potential Sources of Impacts/Benefits

Past Sources of Impact/Benefits

The total number of acres disturbed by management action or natural causes since 1965 in the diversity unit is approximately 5,000 acres. Some of these areas were affected by both natural disturbance and management actions. Past major disturbances are listed below:

- The Clover Mist Fire of 1988 burned approximately 120,000 acres on the Clarks Fork Ranger District. Approximately 9,000 acres were timberlands outside of designated wilderness. Approximately 4,434 acres were burned in the diversity unit, however only 36 acres of the project area were burned. The majority of the burn occurred south and west of the project area. Of the lands burned over in 1988 approximately 990 acres have been planted with lodgepole pine and Douglas-fir seedlings.
- The Reef Creek timber sale was completed in 1965. This sale was on the east and west side of Reef Creek and east of Reef Creek above Camp Creek. Approximately 855 acres were treated with the clear cut harvest method. Approximately 600 acres of these sale areas burned over in 1988.
- The Sugarloaf timber sale was completed in 1979. This sale was on the north and south side of Highway 296, between Russell Creek and Camp Creek. Approximately 200 acres were treated using the first step of a three-step shelterwood harvest method.
- The Camp Creek salvage sale was completed in 1992. Approximately 140 acres were treated to salvage burned timber, and planted with lodgepole pine seedlings. The Cathedral salvage sale was completed in 1992. This sale was on the east and west sides of Corral Creek. Approximately 250 acres were treated to salvage burned timber and it was replanted.

Current Sources of Impact/Benefits

- One grazing allotment, Crandall Cattle and Horse, is associated with the diversity unit. The permit authorizes the grazing of 287cow/calf pairs from June 21 to October 31 under a deferred rotation system. The allotment contains crucial winter range for moose and elk.
- The paving of the entire Chief Joseph Highway increased summer traffic to Yellowstone National Park and year round access to the district; this level of use would continue.
- Existing developments on public and private lands within the diversity unit are:
  - Reef Creek Campground
  - K-Bar-Z Resort
  - Three private residences on Reef Creek
  - One private residence at Camp Creek
  - One utility power line corridor
  - Reef Creek trail
  - Existing roads

Reasonably Foreseeable Future Sources of Impacts/Benefits

Future activities that are likely to occur within the diversity unit include:

- Timber harvest in upper Reef Creek
- Commercial thinning of lodgepole pine in the old clear cut within the project area

- Aspen regeneration adjacent to the Chief Joseph Highway
- Selective timber harvest along the Chief Joseph Highway
- Personal use firewood and Christmas tree cutting
- Grazing of domestic livestock
- Big game hunting and other existing recreation uses
- Existing uses of private lands

3.11.3 Cumulative Effects on Vegetative Diversity and Forest Health

A single vegetative treatment, such as any of the treatment actions proposed, cannot generally cause substantive change to forest health or diversity unless it affects a large percentage of a landscape area. The Clover Mist Fire in conjunction with past silvicultural treatments has affected a large portion of this diversity unit and caused major effects on this landscape relative to diversity and forest health. Natural regeneration of lodgepole pine is negligible after the fire, but some planting has occurred.

Based on the existing condition of the majority of remaining forested cover, the no action alternative would have negligible effect on reversing the declining trend in diversity and forest health in the diversity unit. Overall, diversity would continue to decline, forest health would continue to deteriorate, and risks to forest health would continue to escalate.

However, any of the action alternatives when viewed in the context of the assumed future silvicultural activities and aspen enhancements would contribute a measurable amount of positive cumulative change to many aspects of diversity and forest health within the diversity unit. Distribution of age classes would be increased, the abundance of minor types such as aspen, willow, birch and lodgepole pine would be enhanced, the risk of insect/disease would be reduced, the amount and continuity of fuels would decrease, and fire suppression capability would increase.

3.11.4 Cumulative Effects on Wildlife

The greatest potential cumulative threats to wildlife populations in the diversity unit relate to the long-term decline of habitat value, a decrease in habitat effectiveness caused by additional open roads and increased human use, and large-scale development on either public or private lands. Opportunities that could negate adverse effects of multiple actions over time or cause cumulative beneficial effects relate to enhancement of habitat value by a series of intentional vegetative manipulation projects, and enhancement of habitat effectiveness by reducing the density of open roads when opportunities exist.

Habitat value. There could be short-term adverse effects caused by any of the action alternatives. However, these impacts on wildlife would be inconsequential in comparison to the potential loss of not only the project area, but also the loss of many other high-risk timbered areas to stand replacement fire. This risk is real based on existing conditions of many timbered areas. There is a high probability of occurrence of such events with no proactive management. The probability of catastrophic wildfire within the project area in general, has without a doubt, the greatest potential for adverse cumulative effects on most all wildlife species. For those wildlife species dependent on contiguous blocks of late seral forest and dense canopy closure, the cumulative effects of fire and the subsequent insect infestation has been detrimental, and overall habitat value will continue to decline because of the loss of cover and reduced canopy due to insect mortality and the loss of diversity due to advancing succession.

Habitat effectiveness. The no net increase in open roads policy would negate any cumulative negative impacts of disturbance related to road-associated activity. The greatest potential risk for adverse cumulative effects is associated with a decrease in habitat effectiveness due to public motorized access, in conjunction with a decrease in security or hiding cover. In the context of cumulative effects on wildlife, reduction of open road densities, even in small amounts, would contribute positively to long-term cumulative effects. Although the proposed project area is quite small in the context of the diversity unit size, it is extremely important habitat at present because timber cover is very limited, as much of the area has burned. As the remaining wildlife cover quality is decreasing due to natural causes (insect infestation), the proposed reduction in open road densities and associated increase in secure habitat with any of the action alternatives provides a significant positive contribution toward cumulative effects.

Increased traffic on the Chief Joseph Scenic Byway would cause little additional adverse effect on most species as the use has long been established. Alternative IV causes the greatest positive effect on habitat effectiveness in the diversity unit as it closes the most amount of roads yearlong. Alternative II causes positive effects yearlong within the project area due to yearlong closure, and Alternative III causes positive effects seasonally. The no action alternative does not contribute to enhancement of cumulative effects as it allows open roads and the amount of secure habitat to remain at existing levels.

Development. There would be no cumulative effects to wildlife from additional development on public or private land as no major developments are anticipated.

3.11.5 Cumulative Effects on Soil, Water, and Aquatic Resources

Analysis of the alternatives, of which disclosure has been provided on the previous pages, demonstrates that the management requirements and special design standards, which are proven techniques, provide adequate control to mitigate the potential direct and indirect effects of the alternatives. Thus, there would be no cumulative effects relative to water quality at the Forest boundary or relative to the validated watersheds of concern. Numerous factors particularly related to watershed cumulative effects were considered in reaching this conclusion. Consideration was given to:

- Additive effects of past, present and reasonably foreseeable activities
- Location of proposed disturbances relative to sensitive areas and degraded systems
- Timing, severity, and duration of disturbances and their effects
- Effects on State-classified uses
- Effects on stream health and aquatic life limiting factors
- Overall effects on functions of the riparian and wetland network
- Long-term soil productivity
- Use of this project to correct existing watershed condition concerns

3.11.6 Cumulative Effects on Heritage Resources

There would be no cumulative effects to the heritage resources from any alternative.

Laws and Forest Plan goals and objectives and supporting standards and guidelines affirm protecting heritage resources, and provide a framework for implementation and monitoring. No inconsistencies with Forest Plan direction for heritage/cultural resources were identified, and there would be no direct irreversible or irretrievable effects.

3.11.7 Cumulative Effects on Sensitive Plant Species and Noxious Weeds

An increase in weeds such as oxeye daisy and Canada thistle is likely due to vegetation removal and soil disturbance. Considering the small percentages of the diversity unit involved with treatment areas and current weed management on these species, this planned action combined with past actions would result in a small increase in weeds. Overall, the potential weed spread, consequences, and adverse effects for the diversity unit have a moderate rating. Therefore, future actions to monitor and treat weeds would need to be adequate to address the moderate rating for the risk of weed infestation.

Forest Plan goals and objectives and supporting standards and guidelines affirm maintaining sensitive plant species and their habitats and treating noxious weeds, and provide a framework for implementation and monitoring. No inconsistencies with Forest Plan direction for sensitive plant species and noxious weeds were identified and there would be no direct irreversible or irretrievable effects.

3.11.8 Cumulative Effects on Social and Economic Environment

Direct cumulative benefits. The scale of this project is such that there would be minimal impact when considering only direct revenue from this individual project.

Indirect cumulative benefits. Although the social and economic benefits derived from this project contribute only a small proportion to the overall economic base of the adjacent communities, without many individual projects such as this, a viable commercial wood products industry would not be maintained. Maintenance of a viable industry is essential to public land management because they provide the mechanism (tool) for implementing silvicultural treatments that are necessary to achieve ecosystem and resource sustainability. Without this industry to manipulate forested vegetation, resource and ecosystem objectives could not be attained. Many individual projects such as this small scale proposal, when viewed cumulatively, provide major beneficial effects on both the social and economic well-being of adjacent communities.

3.12 Silvicultural Requirements

3.12.1 Timber Harvest on Lands Classified as not Suited for Timber Production (36 CFR 219.27(c)(1) (1982 regulations)

Timbered lands in the project area being managed as a part of the suited timber base, as identified in the forest planning map, contain small area inclusions (i.e., aspen, riparian, utility corridors, and water impoundments, etc.) having their own separate management goals that emphasize uses other than commercial timber production. These small area inclusions were too small and scattered to be mapped at the forest planning map scale. These non-suited areas were identified and mapped for the project area as a part of this analysis. Therefore, these inclusions as mapped during project analysis would not be managed as a part of the suited timber base.

These non-suited inclusions (aspen, riparian, wetlands, and the utility corridor) would be treated using timber harvest to reduce conifer species from these lands. Merchantable conifer trees would be harvested to protect other multiple use values and activities that meet other objectives on these lands that the Forest Plan has established as appropriate.

Non-suited lands, which are not a part of the inclusions (described above) within the suited base, would also be treated using timber harvest. Merchantable conifer trees would be harvested to protect other multiple use values and activities that meet other objectives on these lands that the Forest Plan has established as appropriate.

The Forest Plan allows harvesting on these non-suited lands as appropriate to attain Forest Plan objectives (Forest Plan Management areas 1D-Utility Corridors (pages III-114-117), 4D-Aspen Management (pages III-153-157), and area 9A-Riparian Area Management (pages III-207-222)).

3.12.2 Adequate Restocking of Lands Within 5 Years after Final Harvest (16 USC 1604 (g)(3)(E)(ii) and 36 CFR 219.27(c)(3) (1982 regulations)

Sanitation and salvage prescriptions are not defined as final harvests; therefore reforestation need not occur within five years of final harvest. The average diameter of Douglas-fir trees infected with the Douglas-fir bark beetle is 12 inches. Based on on-the-ground experience and observations of the adequacy of regeneration in comparable stands in the immediate vicinity, natural regeneration in the proposed treatment area would be sufficient to meet the minimum-stocking requirement.

There are no unusual site conditions within the units that would indicate that adequate regeneration would not occur on these sites. The Deadman Bench project would use sanitation and salvage prescriptions, in Alternatives II and III accordingly, that are not defined as final harvests; therefore reforestation need not occur within five years of final harvest. In Alternative IV there is reasonable assurance that lands can be restocked within five years after the final harvest based on the existing regeneration currently on site within the proposed treatment units.

In many portions of the proposed treatment area sufficient regeneration exists to meet minimum stocking requirements. The vast majority of stands currently have a fully stocked understory made up of Douglas-fir, Englemann spruce, subalpine fir, and a minor component of lodgepole pine. However, reforestation surveys would still be conducted within the first and third year after treatment to assure adequate stocking of tree species is present on the treated sites. If it were determined by these surveys that adequate stocking is not present, planting would be prescribed and scheduled in these areas. Based on this rationale, it is the determination that the lands that would be treated with this action would be adequately restocked within five years of harvest. Region 2 minimum stocking standards are described in Forest Service Handbook 2409.26b.

3.12.3 Even-aged Management (36 CFR 219.27(d) (1982 regulations)

Even-aged management is the preferred treatment method for this project area, with the exception of riparian and wetland areas. The recommended uneven-aged treatment method for riparian areas and wetlands is group selection.

Uneven-aged silvicultural management is not recommended as the system that would achieve the desired condition for suited timber base lands in the project area, and it does not meet the stated purpose and need for this proposal. This system would have been a viable way to meet the desired condition if it could have been implemented before the stands proposed for treatment became infected with epidemic levels of Douglas-fir bark beetles (Biological Evaluation R2-95-02, Biological Evaluation R2-96-01, Biological Evaluation R2-97-03, Technical Report R2-64.) Neither is uneven-aged management the optimal method to regenerate aspen, nor is it the optimal method to regenerate lodgepole pine (Shoshone Forest Plan, which specifies clear cutting for aspen in management areas 3A, 4D, 7E, and 9A.).

The recommended treatment method based on the above references is sanitation and salvage, thinning, or other appropriate even-aged treatment methods that would capture the mortality volume where appropriate, and manage the vegetation utilizing the best silviculture method to position treated stands of vegetation to meet the desired condition as stated in the purpose and need for the project and within the Forest Plan.

3.12.4 Timber Resource Sale Schedule - Culmination of Mean Annual Increment (36 CFR 219.16(a)(2)(iii) (1982 regulations)

Regulations require that all even-aged stands scheduled to be harvested during the planning period have generally reached the culmination of mean annual increment of growth (CMAI). The CMAI requirement is applicable to even-aged stands that are being managed by even-aged treatment methods for timber purposes. In general, stands scheduled for a regeneration cut (e.g., final removal treatment of a 2 or 3 step shelterwood or a clear cut) for timber purposes need to have reached CMAI. The regulation goes on to say "...exceptions to these standards shall be evaluated if it is reasonable to expect that overall multiple use objectives would be better attained." The regulation further says that "...exceptions to these standards are permitted for the use of sound silvicultural practices, such as thinning or other stand improvement measures; for salvage or sanitation harvesting."

The Forest Plan reflects this requirement with the Silvicultural Examination and Prescription General Direction listed on page III-63: Regeneration harvest of even-aged timber stands should not be undertaken until the stands have generally reached culmination of mean annual increment.

All proposed treatments in Alternatives II and III are sanitation or salvage, which are an exception to the CMAI requirement. It was determined by field sampling that all stands scheduled for treatment in Alternative IV have reached CMAI. Based on this rationale, it is the determination that all stands that would be treated have reached CMAI.

3.12.5 Clear cutting is the Optimal Silvicultural Method (USC Title 16, Chapter 36, Sub-chapter I, Section 1604(g)(3)(F)(i)

NFMA requires that "for clear cutting, it is determined to be the optimum method. . . . .to meet the objectives and requirements of the relevant land management plan." Clear cutting is generally considered the primary option for harvest and regenerating aspen in the Rocky Mountain Region and is consistent with the direction in the Shoshone Forest Plan, which specifies clear cutting for aspen.

This proposal would allow clear cutting only on non-suited lands being managed for aspen, riparian/wetlands, and utility corridors (management areas 3A, 4D, 7E, and 9A).

Clear cutting aspen in the Deadman Bench project area would effectively address a number of concerns, while meeting project goals and Forest Plan direction. It would maintain and increase vegetative diversity in the project area by regenerating the aspen component, which is declining due to conifer encroachment into existing aspen stands and lack of aspen regeneration. In conifer encroached stands, removal of all conifers and clear cutting of aspen as appropriate is anticipated to yield the greatest number of aspen seedlings per acre following treatment, maximize growth and vigor of aspen in the treated areas, and set back conifer succession processes that could eventually lead to the loss of aspen in this area. In aspen clones where conifer encroachment is not a factor and where aspen clones are decreasing due to apical dominance, clear cutting is the optimum treatment method to regenerate the clone. This is based on experience with other aspen clones treated in this manner in this general area.

Clear cutting is the most effective method for maintaining and enhancing abundance and distribution of aspen. Clearcutting is also the optimal method to regenerate aspen clones. Aspen regenerates by root and stump sprouts. For effective sprouting to occur, research shows that there must be full sunlight. As little as 30 sq. ft. of basal area/acre left in the area would hinder root suckering. Thus, the shelterwood, seed tree, and individual tree selection methods would not be as effective in regenerating the area because of the overstory left behind after the initial cut is made. Group selection would also not be as effective as clear cutting in regenerating aspen because the

individual groups are generally too small, and the shade cast by the perimeter trees would hinder sprouting of the individual groups. Based on this rationale, it is the determination that clear cutting is the optimum method to enhance and regenerate aspen clones in the project area.

Clear cutting is also the most effective method for maintaining and enhancing riparian/wetlands, because conifer removal reduces competition (i.e., water, nutrients and sunlight) with preferred riparian vegetation. Based on this rationale, it is the determination that clear cutting is the optimum method for restoration and enhancement of riparian/wetlands in the project area. In addition, clear cutting is the most effective method for creating and maintaining utility corridors for power lines because it enhances maintenance capability and removes hazardous trees that may fall on the lines causing power outages and damage to lines that has the potential to ignite a wildfire. Based on this rationale, it is the determination that clear cutting is the optimum method for creating and maintaining the power line corridor in the project area

3.12.6 Size of Openings (36 CFR 219.27(d)(2)(i) (1982 regulations)

The maximum opening size that would be prescribed in any action alternative in this project would be approximately 21 acres. This opening size is tied to the treatment of wetlands. All other treatment openings would result from small patch cuts for enhancement of aspen and other deciduous vegetation to help achieve the desired condition.

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